Exhibit 3-2

Ecological Soil Screening Level Guidance - Draft

Plant and Soil Invertebrate Standard Operating Procedure # 2: Literature Review

June 27, 2000

This page intentionally left blank

Exhibit 3-2

Soil Invertebrate and Plant Standard Operating Procedure (SOP) #2: Literature Review

for

Ecological Soil Screening Levels (Eco-SSLs)

June 27, 2000

DRAFT FINAL

TERRETOX CODING GUIDELINES

The TERRETOX Coding Guidelines presented below follow the format of the TERRETOX coding sheets located in Attachment A. The TERRETOX Coding Sheet is divided into four sections: Quality Assurance Parameters, Test Information, Exposure Information, and Results Information. The field name associated with each test parameter, as presented on the TERRETOX Coding Sheet, is a topic heading. Below each heading is a detailed description of how to code data related to the specific test parameters. With few exceptions, reviewers should code the information as presented by the authors. Decisions regarding which information to code and how to represent the information in the database are based on the terrestrial plant and wildlife toxicity testing methods presented in ASTM and US EPA publications as well as the scientific literature and toxicology textbooks. Test method publications used for the Terrestrial Plant and Wildlife Toxicity Effects (TERRETOX) database are listed in Attachment B.

NOTE: Inclusion of publications into the TERRETOX database is determined by the test media used. If a terrestrial organism is exposed in an aqueous media, the paper will be placed into the AQUIRE database. Terrestrial nematodes are an example of an organism that may be coded either in TERRETOX or AQUIRE. If the test is conducted in soil media then the data are coded in TERRETOX; if the nematode is isolated from soils and exposed using aquatic test methods then the data are coded in AQUIRE. The exception to this rule is for hydroponic studies. Hydroponics is a terrestrial test method and should be coded as such.

NOTE: Only quantitative data are encoded into TERRETOX. If additional data are represented qualitatively (ie., no numeric response values), the qualitative effects are noted in the general remarks section. If the publication only reports qualitative data, the publication will be rejected.

1. Quality Assurance Parameters

Reference Number (#), Author, Year

Reference number is the unique number that identifies a particular publication. This number, automatically assigned by the data entry program, provides the link between data entered and the original publication. On the coding sheet, enter the reference number located in the upper right-hand corner of the hard copy of the publication, the last name of the first author, and the publication year in the data field REFERENCE #, AUTHOR, YEAR.

Total Tests

Total tests encoded for a publication are recorded by the reviewer in the TOTAL TESTS data field. The total test number equals the total number of results records coded in the RESULTS INFORMATION section of the coding sheet for each publication. The total tests are counted after the data abstraction process has been completed.

Reviewer/Review Date

The person conducting the data abstraction enters his/her last name in the REVIEWER data field. The date on which the publication was reviewed should be entered in the REVIEW DATE field using the format of month/day/year.

QA Date/NAME

Following data coding and prior to data entry, an ECOTOX staff member conducts a screening check of each coding sheet to ensure completeness and accuracy of data transcription. The person conducting this quality assurance screening check enters the date of the QA check in the QA DATE field using the format of month/day/year, and their last name in the NAME data field.

Test Identification (TID)

Test identification number (TID) is assigned by the reviewer to designate each unique test design. A unique test design may be characterized by a new test chemical, test species, test location, or exposure type. Additionally, there are experimental design (EDES) parameters that will influence a test scenario sufficiently to warrant an independent Test TID. Such parameters include tests conducted at different test temperatures or conducted during different seasons. Some examples are found in Tables 1 & 2.

Table 1: A study is conducted with 2 different chemicals and the exposure for 2 species is started at 3 different lifestages. The Test IDs would be:

TEST ID	Unique Test Design
1	Benzene, Worm, Cocoon
2	Benzene, Worm, Juvenile
3	Benzene, Worm, Adult
4	Benzene, Bird, Egg
5	Benzene, Bird, Juvenile
6	Benzene, Bird, Adult
7	Toluene, Worm, Cocoon
8	Toluene, Worm, Juvenile
9	Toluene, Worm, Adult
10	Toluene, Bird, Egg
11	Toluene, Bird, Juvenile
12	Toluene, Bird, Adult

Table 2: A study is conducted with 1 chemical and the exposure for 1 species is conducted at 3 different temperatures. The Test IDs would be:		
TEST ID	**Unique Test Design**	**Exposure Info Remark**
1	Benzene, Worm, 15C	EDES/Conducted at 15C//
2	Benzene, Worm, 20C	EDES/Conducted at 20C//
3	Benzene, Worm, 25C	EDES/Conducted at 25C//

If appropriate, include information about the Experimental Design parameters in the REMARKS data field for Species Information, Exposure Information or Soil Information as well as in the REMARKS data field for each independent Observed Response value reported.

2. Test Chemical Parameters

A standardized identification number and name for each chemical is recorded in the database to ensure quality and consistency. Toxicants, carriers and positive control chemicals reported in ECOTOX are assigned a Chemical Abstract Services (CAS) Registry number and are referred to by the Ninth Collective Index (9CI) standard nomenclature. The CAS number and 9CI name are stored in a chemical card file and an online index file (CHEMNAME). CHEMNAME is available for screening CAS numbers and chemical names used in ECOTOX. Chemical name synonyms are not stored electronically, but are available from the chemical card file.

Test/Positive Control/Carrier/CAS Number/Chemical Name/Type

Record the test, carrier and/or positive control chemical name as it is reported in the publication. The test chemical, as presented by the author, is reported on line number one (TEST). The CAS number is assigned by locating the chemical name in the ECOTOX chemical card file. If the chemical name is not in the chemical card file, record a ‘no’ in the CAS number field and the coding sheet will be referred to ECOTOX staff for CAS number verification following completion of the coding and screening quality assurance checks.

For the remaining chemical information lines, record the chemical name as reported by the author regarding any carriers, solvents or positive controls used for the test. If neither a carrier/solvent nor a positive control was used, report as 'NR'. If a carrier/solvent or positive control was used, circle ‘Carrier’ or ‘Positive Control’ as applicable. Frequently used carrier/solvent CAS numbers are listed in Appendix A. The CAS numbers for positive control chemicals are assigned by locating the chemical name in the ECOTOX chemical on-line or card file. If the chemical name is not in the chemical card file, record a ‘no’ in the CAS number field and the coding sheet will be referred to ECOTOX staff for CAS number verification following completion of the coding and screening quality assurance checks.

Note: Water may be used as a carrier for media/soil exposures, but not for aqueous/hydroponic exposures.

Note: Exposure and observation data for carrier and positive control chemicals are reported in the Exposure and Results sections. Refer to these sections for specific instructions.

Chemical Grade

Record the chemical grade information for each chemical reported in the GRADE data field (refer to Appendix B for the applicable codes).

Chemical Purity

Record the numeric percentage information about the purity or active ingredient of the chemical in the PURITY data field (e.g., if the author reports 97% purity, 97 would be entered into this data field. PU for purity would be entered into the FORMULATION data field (see Chemical Formulation)).

Chemical Formulation

Record the chemical formulation code for each chemical reported in the FORMULATION data field (refer to Appendix C for the applicable codes).

Chemical Characteristics

Supplemental information about the test chemical is entered into the CHARACTERISTICS field. If a mixture of labeled and unlabeled chemical is used, remark "labeled and unlabeled" in this field. Record additional relevant chemical information such as trade names, common names, or isomers in this field.

Radiolabel

If a radiolabeled chemical is tested, record the isotope in the RADIOLABEL field (see Appendix D for codes). When the specific isotope is not reported or when multiple isotopes are reported, the field should be marked with an asterisk (*). In REMARKS, note either RADIO/no isotope reported// or RADIO/isotope xx and isotope yy//. When both radiolabeled and unlabeled test chemicals are used in a test, report the radiolabeled isotope and code "labeled and unlabeled" in the Chemical CHARACTERISTICS field.

Note: Any REMARKS made for fields in this section will be recorded according to the instructions set forth in Test Information.

3. Test Information

This section is used to report general information describing the test scenario. If any of the following information changes, a new Test ID is assigned and a new coding sheet is required. Specifically, the Test Information section describes the test organism, the test location and exposure type, information about the type of controls used, the total number of doses, and the application frequency. Refer to Table 3 for coding examples.

Species Number/ Scientific/Common Name

The test organism is identified by the current scientific name as verified in the taxonomic literature. Enter the species name, as presented by the author in the SPECIES SCIENTIFIC/COMMON NAME field. Each unique test organism is assigned a species number which is stored in the CRITTERS database. Locate the number for the species in the CRITTERS database and enter it in the SPECIES NUMBER field. If the species is not in the CRITTERS database enter 'no' in the SPECIES NUMBER field, and the coding sheet will be referred to ECOTOX staff for species verification following completion of the coding and screening quality assurance checks. For each species number, the verified name, taxonomic code, nomenclature history, and verification sources are kept on file for quality assurance documentation.

Generally, when coding effects in ECOTOX, the data are reported for each individual species. Field studies may report results for a target community (e.g., beneficial and non-beneficial insects) or for an entire enclosed ecosystem (e.g. system-level primary productivity or respiration). If a community was tested, be as specific as the author is about the taxonomic grouping.

Decisions regarding the inclusion of species in TERRETOX are based on published terrestrial ecotoxicology standard methods and procedures documentation (eg., Menzer et al 1994; US EPA testing series; ASTM testing series). The focus for TERRETOX is to collect publications with data for soil invertebrate and microbial species, plant species (agricultural and native), wildlife avian species (e.g. mallard, pheasant or bobwhite), wild mammalian species (e.g., meadow vole, deer mouse or mink), terrestrial lifestages of amphibians and reptiles, and beneficial invertebrate species (e.g., honey bee, leafcutter bee or alkali bee). If data for other species including laboratory, domestic or non-beneficial organisms are reported in a publication, data for all test species are coded for entry into TERRETOX. Publications focusing primarily, or solely, on laboratory, domestic or non-beneficial organisms are not actively acquired or coded at this time.

Organism Source

Report the source of the test organism in the ORGANISM SOURCE data field (see Appendix E for codes). The source explicitly includes the strain of the organism, e.g. laboratory strain versus wild strain.

Lifestage/Age

The LIFESTAGE/AGE data field records the specific lifestage and/or age for each test organism at beginning of exposure, as reported in the paper (see Appendix F for lifestage codes and Appendix I for time units associated with the age of the organism). Record the lifestage information in the first box and age information in the second box on the coding sheet. Record as 'NR' if the information is not reported in the publication.

Organism Characteristics (Org Characteristics)

Report any general information provided about the test organism. Characteristics may include information such as specific strain name, cultivar, variety, weight, length, developmental stage, hybrids or taxonomic groupings used to describe the organism being tested.

Note: Information regarding the sex of the test organism is coded in the Sex field, see Exposure Information. The sex of the organism is often directly linked to the exposure and subsequent response observations; for example, specific reproductive responses are unique to males or females.

Note: When reporting a cultivar, include 'cv.' before the name of the cultivar. Include 'var.' for variety in a similar manner.

Table 3. Test Information Coding Sheet Example

SPECIES SCIENTIFIC/COMMON NAME __Aphis sp._____			ORGANISM INFORMATION
SPECIES NUMBER	5519		
ORGANISM SOURCE	WLD		
LIFESTAGE/AGE	NR	1-2 d	
CHARACTERISTICS	*A. mellifera* and *A. ligustica*		
TEST LOCATION	LAB		EXPOSURE INFORMATION
EXPOSURE TYPE	FD		plants sprayed outdoors in evening; moved to lab next day; bees exposed to plants in lab
EXPOSURE DURATION	6 D		
STUDY DURATION	2 WK		
CONTROL TYPE	B		
NUMBER OF DOSES	3		
APPLICATION FREQUENCY	ADL		
MEDIA TYPE	NAT		SOIL INFORMATION
SOIL TYPE	Pedozioic Clay -silt		
SOIL TEXTURE %	**SA** 79 **SI** 15 **CL** 6		
MEDIA PH	5.6		
MEDIA ORGANIC MATTER	5 %		
MEDIAMOISTURE (%)	31		
MEDIA CEC	NR		
SOIL CONC MEASURED)/ DRY-WET WEIGHT	M	DRY	

Test Location

Report the location or setting in which the experiment was conducted in the TEST LOCATION data field (see Appendix H). For example, a natural field study (FieldN) is an experiment conducted outdoors in a natural setting. The test organisms are sampled in the wild, e.g. population counts. Outdoor studies conducted in a simulated environment are coded as an artificial field study (FieldA). Artificial field studies include organisms isolated from their natural environment via an enclosure of some

type, e.g. cages or fencing. If the publication does not provide enough information to distinguish between FieldA and FieldN, then use the code FieldU to indicate that the field test type is unknown. Laboratory tests (LAB) are conducted indoors under controlled laboratory conditions. If the location or setting cannot be identified as laboratory or field from the publication, code as Not Reported (NR).

Exposure Type

For the TERRETOX database, the term 'exposure' is used to refer to the mechanism by which the toxicant was applied. Organisms are typically exposed to toxicants through diet, injection, inhalation, topical or environmental routes. On occasion, an exposure may be through multiple routes (e.g., such as topical and oral).

Some exposures could be coded a variety of ways. For example, exposure as an aerial spray to a field plot could be coded either as a spray application or as exposure through multiple routes, eg. topical (through skin) and diet (from consumption of exposed vegetation) for animals, or topical (through leaves) and environmental (root uptake) for plants. Within the TERRETOX database, this instance is coded as a spray application. Multiple exposure route coding is applicable when the organism is exposed through two *independent* applications, for example, a contaminated diet *and* toxicant inhalation for animals or contaminated soil *and* leaf spray for plants. In this scenario, 'MU' would be entered into the EXPOSURE TYPE data field and a remark (TYPE/'FD' and 'IH'// or TYPE/'PR' and 'FS'//) would be noted in the Exposure Info remarks section.

TERRETOX does not include in vitro assays [i.e. an experimental trial, involving biological matter, which is exposed to a toxicant in an artificial apparatus rather than within a living organism] in the database. Studies in which the living organism is exposed as a whole, but an effect on an internal process is examined outside the body after the exposure, are coded (e.g. enzyme functions). The database contains some studies using excised organs and cell cultures from plants, however these types of studies are not actively coded at this time. Future coding of these studies is under discussion.

When coding, report the specific exposure type, e. g., for an intercutaneous injection, code as IC (intercutaneous) not I (injection). For an environmental exposure, code as HS (hand spray) not V (environmental). If an exposure type is not reported, code as Not Reported (NR). Refer to Appendix J for exposure type codes.

Exposure and Study Durations

A toxicity test may range in duration from a pre-treatment period through the actual toxicant exposure and conclude with observations of the organisms post-exposure. Duration information is coded using the units reported in the publication (see Appendix I for valid units). Refer to Table 4 for a coding example. Exposure and study durations are reported with the Test Information. Observation Duration is reported with the Results Information.

Table 4. Example 17-day experimental period with 2-day pre-treatment, 5-day exposure, and 10-day observation. Note: Pre-treatment days are not included in the study duration.

	DURATION OF EXPERIMENT																
	Pre-Trt		Exposure					Observation									
Calendar Days	1	2	3	4	5	6	7	8	9	10	11 *	12	13	14	15	16	17
Test Periods	1	2	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10
Reported Days (Study Duration)	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Note: In test scenarios where incubation times are reported, ie. enzyme fixation assays, be careful to report the toxicant exposure time *not* the assay incubation time.

Exposure Duration

The exposure duration is a mandatory field for inclusion in the TERRETOX database. In cases where the observation time is the only duration reported, it is assumed that the exposure duration is equivalent to the observation time. If the exposure duration is not reported, the paper is rejected. The period of time recorded in the EXPOSURE DURATION data field is the time of actual exposure to the chemical. For example, in Table 4 the exposure duration equals 5D.

In some cases a biological time is used, such as an exposure time reported as “until hatch”, “growing season” or “after the nth egg has been laid”. Use the code from Appendix I that best describes the author's words. However, references to time such as “observed at end of the study period” are not coded; such papers are rejected as having no exposure duration.

For injection and environmental exposures where the actual exposure is dependent on biological and environmental conditions, the exposure time is recorded as equivalent to the study time. This assumption is made to ensure consistency in data representation; it is not necessarily a true reflection of the exposure time.

Study Duration

The study duration is the total time of the study *excluding* pre-treatment times. In the example in Table 4, the study duration is equal to 15D (5D exposure plus a 10D observation). In cases where the observation time is the only duration reported, it is assumed that the study duration is equivalent to the observation time. The study duration will be reported as 'NR' if no observation or study time is reported.

NOTE: for most field studies the exposure and study duration are identical because it is difficult to determine when the exposure ends. It is difficult to know when the application has completely dissipated in the environment. For lab studies the exposure and study duration may be different. This difference will be seen when there is a recovery

period from exposure duration. For lab studies when the treatment is some type of injection or diet (intraperitoneally or by gavage), study duration and exposure duration are the same.

Control Type

Effects of toxicant exposure are evaluated by comparing the exposed organisms to untreated organisms - the controls. All toxicity tests should include a concurrent control where the test conditions are identical except for the absence of the toxicant. Some toxicity tests will also include a control for other test conditions such as the use of a solvent, feeding or acclimation requirements, historical or pre-exposure conditions and for establishing reproducibility by use of a reference toxicant. (Doull et.al. 1980)

Report the type of test control(s) used in the study (Appendix M) by recording the applicable code in the CONTROL TYPE field. If more than one type of control is used in the study, e.g., a dilution water and carrier control, code 'M' for multiple controls. Often comparisons are made that do not meet the criteria for a control; these types of comparisons include starvation studies and acclimation periods. Report the studies that complement the toxicity test, e.g. a starvation study used in a feeding behavior or avoidance test, as a comment in the REMARKS data field in the Test Information section of the coding sheet. Sometimes a paper will report a table of baseline or historical control values. Do not code these values unless there is a direct correlation to a measurement or endpoint; code only control values which complement response values.

When data for the control are reported only in graphical format, interpret the data as accurately as possible and remark that the control data were obtained from a graph in the results information section. Data points derived from a graph are most typically represented as an approximation of the data point, a range around the specific data point or as a range for all of the represented values.

If a control is identified for the test but no exposure or results data are reported, record the appropriate control type code in the Control Type field. No data will be coded in Exposure or Result Information fields.

Number of Doses

Report the total number of exposure doses, including the controls, for each independent test design in the NUMBER OF DOSES data field. If number of exposures is not reported, e.g. in a publication reporting only calculated endpoints such as LD50s, code the field as 'NR'. Do not include endpoint or ranged doses or number of replicates in the total number of doses.

Application Frequency

Report the frequency of the dose application in the APPLICATION FREQUENCY data field. Refer to Appendix K for application frequency codes and units.

Exposure Media

Report the type of exposure media, (e.g., natural or artificial soil, aqueous (hydroponic), filter paper), in the EXPOSURE MEDIA data field using codes presented in Appendix L. Report as 'NR' if you cannot

determine the exposure media from the paper. If an aqueous exposure is conducted in pore water from a specific soil, report the soil parameters in the soil characteristics fields (pH, CEC, OM, etc.).

Soil Type

Report the scientific name of the natural soil or commercial name of the artificial soil used in the study in the SOIL TYPE data field. If the scientific name is not included report the type of soil using the author's terminology, eg., forest soil, sandy loam soil, arboreal coniferous soil.

Soil Texture

Report the texture of the soil as stated by the authors in the SOIL TEXTURE data field using percentages of sand (SA), silt (SI) or clay (CL).

Note: Clay may be reported as bentonite, kaolinite or montmorillonite.

Media pH

Report the pH of the test media used in the MEDIA pH data field. If the pH of the treated media is not presented, but the pH value is stated for the untreated or acclimation media, code the untreated media pH and add an asterisk to the end of the value. If the author specifies a measurement method for the pH value (e.g.,that the pH value is measured by pHKCl or pHCaCl2), code the pH value and identify the measurement method in the REMARKS field. If the pH of a specific soil type is not given in the publication, a search of the USDA/NRCS National Cooperative Soil Survey (USA) online site, at the following web address: http://www.statlab.iastate.edu/cgi-bin/osd/osdname.cgi , can be conducted for the specific soil series. If the pH is found, range the pH values for all soil depths in the pH data field and remark in the comments section pH/from USDA web source//. Attach a printout of the pH information from this site to the publication.

Media Organic Matter and Units

Report information about the test media organic matter as presented by the author. Use the measurement and units reported by the author, eg., total organic carbon (TOC), particulate organic carbon (POC), organic carbon (OC), coarse particulate organic matter (CPOM), particulate organic matter (POM), dissolved organic matter (DOM), ash free dry weight of soil, ash free dry mass of soil, percent organic matter, percent peat, loss on ignition (LOI), organic matter content (OMC). If carbon and/or nitrogen content of the soils are reported, record these values in the Soil Information Remarks section; organic matter content may be estimated from these values. If the authors report that a standard (e.g., OECD) or commercially available artificial soil is used, but do not present organic matter content, use the organic matter content reported in the standard test method referenced by the author. If organic matter is reported for the untreated or acclimation media, code this organic matter value in the same way as outlined previously and denote with an asterisk. If the organic matter of a specific soil type is not given in the publication, a search of the USDA/NRCS National Cooperative Soil Survey (USA) online site, at the following web address: http://www.statlab.iastate.edu/cgi-bin/osd/osdname.cgi , can be conducted for the specific soil series. If the organic matter is found, range the organic matter values for all soil depths in the OM data field and remark in the comments section

OM/from USDA web source. Attach a printout of the organic matter information from this site to the publication.

Media Moisture

Report percentage of moisture in the test media in the MEDIA MOISTURE data field. If moisture is reported for the untreated or acclimation media, code this moisture percentage and denote it with an asterisk.

Media Cation Exchange Capacity (CEC)

Report cation exchange capacity of the test media in the MEDIA CEC data field. If the cation exchange capacity is reported for the untreated or acclimation media, code this value and denote with an asterisk.

Soil Concentration (CONC) Measured / Dry-Wet Weight

If soil was the exposure media, use the first data field to report if the toxicant concentration was measured in the soil. If measured, code as ' 'M' in the SOIL CONC MEASURED data field. If not measured or no information is provided, code as 'U' or 'NR' respectively in the SOIL CONC MEASURED data field.

Soil Concentration (CONC) Measured: Dry/Wet Weight

Record whether soil concentration was reported based on dry or wet weight in the DRY - WET WEIGHT data field.

Remarks

Test Information REMARKS sections are used to include additional information necessary for interpreting any of the specific test information fields as well as for providing information concerning the test in general. When additional information is necessary for a given field write 'FIELD NAME/remark text//' (refer to Attachment C for applicable field name abbreviations). For general information that is not associated with a specific field, label the Remark as Other Effects (OEF). The Experimental Design (EDES) notation is used to identify information that differentiates between exposure scenarios but does not directly implement changes in the data fields. Information that may make a significant change in test design includes varying exposure substrates or seasonal exposure scenarios.

4. Exposure Information

This section is used to record the exposure parameters for each specific test. A specific test is identified by the Test ID (TID) number as previously described. Within each specific test, information is recorded for every treatment level including test controls, positive controls, carrier controls, and toxicant exposures. Such information includes the sample number and sex, the exposure dose, whether the dose is reported in ionic form, the chemical analysis method, and any pertinent remarks (see Table 5).

Dose ID and Dose Number (No.)

Each treatment in a test is assigned a Dose ID and a Dose Number. Controls are reported first and identified by the appropriate letter code from Appendix M in the DOSE ID field. Exposure doses are identified by the letter 'D'. A link is created to calculated endpoints that are dependent on multiple exposure doses by coding a line identified by the letter 'E' (the linkage 'E' is not used for BAF, TKNO or LTxx/Etxx data. These are linked to a specific dose). Information taken from a graph (responses that DO NOT have endpoints or statistics) may be coded using a ranged dose 'R' that encompasses all of the exposure concentrations. If more than one type of control is used in the study, e.g. a dilution water and carrier control, code two lines for control, ('C' for the dilution water control and 'V' for the carrier control) in the DOSE ID field. If more than one control of a specific type is used, number each control in the set as a replicate, e.g. V.1, V.2. If a control or treatment is identified for the test but no exposure data are reported, there will not be any data to code for Exposure Information or Result Information. See Tables 3, 4 and 5 for coding examples.

When replicates are used *and* the results are reported separately for each replicate, code a separate line for each replicate. When the publication notes that replicates were run but the author *only* reports the results as the mean of the replicate values, do not code individual lines for the replicates but instead note this information in Remarks, ie. ‘x replicates’; see also the Observed Response Value section in Results Information for additional instructions.

When dose data are reported only in a graphical format, interpret the data as accurately as possible and remark that the data were obtained from a graph. Data points derived from a graph are most typically represented as an approximation of the data point, a range around the specific data point or as a range for all of the represented values.

Note: For the example in Table 5 , the Number of Doses reported in Test Information would be six (6) to represent the two control levels and four treatment levels; all doses tested are recorded in this field regardless of whether responses are reported. Endpoint (E) and range (R) "doses" and replicate concentrations DO NOT get counted in the total number of doses.

TABLE 5. EXPOSURE INFORMATION

DOSE ID	DOSE NO	N	SEX	DOSE	SM	VALUE	UNIT	ION	M/U	RN
C	1	10	F	0	-	-	ppm	-	U	1
C	2	“	“	“	-	-	“	-	“	NR
V	3	“	“	1	-	-	ug/l	-	M	NR
D	4	“	“	3	SE	0.01	ppm	Cu	“	2
D	5	“	“	“	“	0.15	“	“	“	“
D	6	“	“	9	“	0.02	“	“	“	“
D	7	“	“	“	“	0.15	“	“	“	“

TABLE 5. EXPOSURE INFORMATION										
DOSE ID	DOSE NO	N	SEX	DOSE	SM	VALUE	UNIT	ION	M/U	RN
E	8	NR	"	NR	NR	NR	NR	"	"	NR

GENERAL REMARKS

1. CNTRL/Control for first generation only//

2. DOSE/Conc reported as flower residues//

NOTE: On occasion, when coding data for the Exposure Information section, the number of test exposures and/or replicates will exceed the allotted coding space. If this should occur, continue coding on a second sheet. Note at the bottom of the exposure information section on the first page that the data continues on a second page.

NOTE: When concentrations are not reported for soil and pore water doses, but endpoints are reported, code exposure information as 'E-dose# = NR', then code two separate endpoints for the soil and pore water endpoints in the results section. Add a remark RVALUE/soil conc// or RVALUE/pore water conc// respectively.

Sample Number (N)

Sample number, denoted by an 'N' on the coding sheet, reflects the sample size at each exposure dose, i.e., the number of test organisms per treatment. Code as 'NR' if not reported.

Sex

This field identifies the sex of the organism (male (**ML**), female (**FM**) or both (**BH**)) at each exposure level. The importance of this field becomes apparent where organisms of both sexes are exposed at a given treatment level, but the observations are conducted on either the male or female. In this instance, the SEX field would be coded as **BH** in Exposure Information, with individual results reported for **ML** and **FM** in Results Information. See Results Information and Table 5 for coding examples. Code '**NR**' if not reported.

Dose

Report the exposure dose as reported in the publication. Report the approximation (~), minus (-), greater than (>), or less than (<) symbols used by the author(s) to describe the exposure dose. The mean and/or range is coded in the DOSE data field and the unit in the UNIT field, see below. If the range values are confidence interval (CI), confidence limits (CL) or fiducial interval (FI) code the abbreviation in the SM data field. See the coding example presented in Table 5 .

NOTE: If a background concentration is reported for the chemical being applied, report the background value in the control dose in the DOSE field.

Statistical Method (SM)
Report the method used to determine the range around the Dose in the SM data field, if reported by the author(s). Use standard codes for the methods, i.e., standard deviation (SD), standard error (SE), confidence interval (CI), confidence limits (CL) or fiducial interval (FI) or range (R). If the interval around a value is not identified in the paper as SD, SE, CI, CL, FI or R, then code as not reported (NR).

Value
Report the numeric value of the standard deviation or standard error around the Dose in the VALUE data field, as reported by the author(s).

Unit
Report the measurement unit that corresponds to Dose in the UNIT data field (see Appendix N for standard units).

Ion
For substances containing metals, e.g., organotins, report the dose as the ion if the concentration presented by the authors is reported as based on the ionic form of the compound (e.g., Sn). Code the appropriate ionic symbol in the ION data field (see Appendix O for ion codes). If concentration is based on the total compound, code 'NR' in this field. For non- metal substances, code 'NR' in this field.

Chemical Analysis Method (M/U)
The M/U data field identifies whether nominal or quantified exposure dose values were reported by the author(s). For the specific exposure level, report whether toxicant and/or carrier concentration was measured (M) or calculated/nominal/unmeasured (U) (see Appendix P for codes and definitions). When it is not clear whether reported concentrations are measured, calculated or unmeasured, record as Not Reported (NR).

Remark Number/Remarks (RN)
When there are remarks for a specific test, the REMARKS field as well as the Remark_Number RN (remarks number) data field, will be coded. Remarks are identified by the coding field abbreviation listed in Attachment C. The Remark Number (RN) field is used to link the remarks associated with each specific test. Each unique Remark is assigned a Remark Number, and only one Remark Number is used per result entry. Use an independent unique Remark Number for each section of the database, i.e., do not carry over Remarks or Remark Numbers from the Exposure section to the Results section. Refer to Tables 3 and 5 for coding examples.

General Remarks
General information about the exposure such as any specific methodology or techniques used is recorded in the REMARKS data field with the Other Effect (OEF) identifier. General information about the test may include names of other chemicals that were tested but were not coded for TERRETOX, results are not provided, effects that have been reported but are not linked to a dose, effects that are

reported but are not applicable to TERRETOX (e.g. in vitro studies, selectivity ratios, acute to chronic ratios), or effect modifiers such as changes in soil pH, temperature or humidity.

5. Results Information

This section is used to record observed effects for each control and dose level reported for the specific test. The Dose ID and Dose No. is carried forward from Exposure Information. Information specific to the observed response includes the sample number and sample unit, exposure duration, descriptors of the effect observed, the response site, and a quantitative measure of the response. Refer to Table 6 for specific fields included in this section of the TERRETOX Coding Sheet.

Dose ID & Dose No

This is the same Dose ID and Number as recorded for each treatment level under the in Exposure Information. Transcribe the Dose ID and Dose Number for each treatment level.

Sample Number (SMP#) and / Units

The sample number reflects the sample size (e.g., 10 embryos) that the observation or response value is based on at each exposure level. For endpoints based on calculations (e.g. LD50, NOEL, etc.) rather than individual dose measurements, the sample number will be coded as 'NR'. Code 'NR' if no information about the observed sample has been reported.

Sample units correspond to the sample number; i.e., the unit on which the measurement or endpoint is based (see Appendix Q for applicable codes). Code 'NR' if the sample unit is not reported.

EXAMPLE: For a sample size of 190 eggs, the sample unit is eggs (EG); therefore, if the effect measurement is HTCH, and the observation response value is 90%, then 90% of 190 eggs hatched.

NOTE: For generational studies and measurements based on the progeny, note F1, F2, etc. in the sample units field.

NOTE: If a sample number is not provided, but a "unit" is, always enter the unit in the sample units field.

Note: A FieldN test scenario involves exposing plots or sample areas, in addition to specific test organisms. Usually the number of exposed organisms is unknown. The number of plots or sample areas is coded as '#/EU' (the number of experimental units) in Results Information rather than in the Exposure Information Sample Number field. See Table 5 for coding examples

Observation Time Duration (OBSRV DUR)

The Observation Duration reported includes exposure time plus any additional days up to the time at which the response to the toxicant was observed. It does not include pre-treatment time. In the example in Table 4, the observation was made on day 11; therefore, the observation duration time is 9D. If the observation time is not reported or unable to be explicitly determined, code as less than or equal to (<=) the exposure duration. NR should not be coded in this data field.

Observations during the pretreatment time are reported as negative values. For the Table 4 example, the observation time for a pretreatment sample collected on day 2 of the pretreatment period would be recorded as -1D. Report as '-x' any pretreatment response observations for which time is unknown.

Note: In test scenarios where incubation times are reported, e.g.. enzyme fixation assays, be careful to report the toxicant exposure time *not* the assay incubation time.

Note: In test scenarios that involve generational studies, the observation duration times are reported from the time the parents were exposed. For example the parents were exposed for 10 months prior to mating, and the progeny was born 2 months later, the observation duration for both the adult REP PROG effect and for the juvenile DVP ABNL is 12 months. The exposure duration would be the same for both - 10 months. The only difference between the two effects is in the sample unit. The sample unit for the adult effect would be 'AD' and for the juveniles it would be 'F1'.

Table 6. Results Information Coding Examples

Dose ID & No.	SMP # UNIT	OBS DUR	EFCT	MEAS	END PT	R	STAT	LVL	PR	SITE	OBSERV.RESP VALUE/UNIT X Range SM Value Unit	DW %	% LPD	RANK	RN	REMARKS
C1	10 F	5h	MOR	MDTH	NR	-1	NR	NR	NR	NR	11.5 SD 7.8 d	NR	NR	-	1	1 RVALUE/ from graph// 2 MSMT/ asymptotic level//
C1	" "	"	ACC	RSDE	"	-1	"	"	"	WO	1245 ug/g	W 25	42	-	2	
V3	" "	"	MOR	MDTH	"	-1	"	"	"	NR	15.8 SD 5.9 d	NR	NR	-	1	
D4	" "	"	"	"	"	-1	"	"	"	"	12.8 SD 7.6 d	"	"	-	1	
D5	" "	"	"	"	"	-1	"	"	"	"	15.6 SD 5.5 d	"	"	-	1	
D5	" "	"	ACC	RSDE	"	-1	"	"	"	WO	1459 ug/g	W 33	44	-	2	
D6	" "	"	MOR	MDTH	"	-1	"	"	"	NR	16.6 SD 8.0 d	NR	NR	-	1	

Table 6. Results Information Coding Examples																
Dose ID & No.	SMP # UNIT	OBS DUR	EFCT	MEAS	END PT	R	STAT	LVL	PR	SITE	OBSERV.RESP VALUE/UNIT X Range SM Value Unit	DW %	% LPD	RANK	RN	REMARKS
C1	"	1-5d	REP	PROG	NR	-1	NR	NR	NR	NR	680 (645-690) eg/d	NR	NR	-	NR	
C2	"	"	"	"	"	-1	"	"	"	"	983 (825-1012) eg/d	"	"	-	NR	
V3	""	"	"	"	"	-1	"	"	"	"	259 (243-272) eg/d	"	"	-	NR	
D4	-"	"	"	"	"	-1	SIG	<.05	P	"	246 (232-257) eg/d	"	"	-	NR	
D5	"	"	"	"	"	-1	"	"	"	"	255 (242-267) eg/d	"	"	-	NR	
Data for REP/PROG would be continued for dose levels 3 and 5																
E8	NR NR	20d	MOR	MORT	LD50	-1	NR	NR	P	NR	9.8 (5.6 -11.2) d	NR	NR	-	1	

Effect

Ecotoxicology is the study of the toxic effects of natural or artificial substances on living organisms (e.g. fish, birds, plants) ...". The effects may manifest at various levels of organization from sub-cellular through individual organisms to communities and ecosystems. Effects may be both positive and adverse; toxicology focuses on the adverse effects. Adverse effects include short-term and long-term lethality and sub-lethal effects such as changes in behavior, growth, development, reproduction, uptake and elimination, and tissue structure. (Rand 1995)

In TERRETOX, effect groups include accumulation, behavior, biochemistry, cellular, growth, mortality, physiology, population, reproduction and ecosystem (see Appendix R for definitions). Within each effect group, the observed effect must be quantified in a reproducible way. In TERRETOX, two mechanisms are used to represent the observed effect: measurements and endpoints. Measurements include quantitative observations that describe and evaluate biological responses to toxicants, while endpoints are based on calculations derived from statistical analysis of the observations. Therefore, while measurements are direct biological observations, endpoints provide a statistical comparison of responses to toxicants. Coding criteria for each of these mechanisms is described below, directly following the General Notes section. The 'General Notes' section provides guidelines for extracting effect/ measurement data from the publication.

General Notes:

1. Often data are reported as the individual measurement as well as a mean or range for these values. Report individual test results only. However, if both raw data and percentages, e.g. number survived and % survival, are reported, both values are coded. An exception to this coding procedure occurs when data reported for individual endpoints are graphed and mean/median data are explicitly reported. In this case, code all the data (remark on data points taken from the graph, and note mean LC50 or Median LC50 in the comments).

2. When data for the effect are reported only in graphical format, interpret the data as accurately as possible. Data points derived from a graph are typically represented in TERRETOX as an approximate value, a range around the specific data point or as a range for all of the represented values. Remark that the response value data were obtained from a graph.

Data from graphs should be combined into a single test record unless data points are statistically analyzed data points or calculated endpoints. Statistically analyzed data points and calculated endpoints are always coded separately. Exposure number in ranged results information would be coded as #1 - #L (where #1 is the first and #L is the last number of the doses in the range). A separate line should always be coded for the control.

3. Data may be reported for an individual species as well as for a community or population. Generally, report the measurements and endpoints as reported by the author.

Measurement (MEASMENT)

Generally, "measures" or "measurements" are variables used to aid in the interpretation of the degree of response to a toxicant by an organism. For example, measures of behavioral effects in TERRETOX include general behavioral changes (BEH GBHV), changes in feeding activity (FDB FDNG), and stimulus avoidance (AVO STIM). Appendix S lists the measurements currently used for each of the effects in the TERRETOX database.

Endpoint/Result Set (R)/ Stat/Level/Assigned (PR) (ENDPT/STAT/Level/P or R)

Endpoint (ENDPT)

An endpoint is a value derived from statistical analysis or calculation of a specific measurement, or series of measurements, made during the test. Endpoints may be classified as measurement endpoints or assessment endpoints. Assessment endpoints refer to environmental parameters such as population, community or ecosystem measurements, e.g., growth rates or sustainable yields. Measurement endpoints refer to specific variables that are used to evaluate the assessment endpoints, such as diversity or evenness. (Hoffman et.al. 1995; US EPA 1996)

The ECOTOX databases utilize assessment and measurement endpoints which quantitatively represent the response(s) of a given individual, population, or community to the effects of a toxic agent. Appendix T lists and defines endpoints used in TERRETOX. For each endpoint, effect and measurement must also be coded. Refer to Table 5 , Results Information, for coding examples.

For some endpoints, linkage to an exposure dose, and therefore an Exposure Dose Number, is especially important. These endpoints include BAFs or time associated endpoints such as LTxx and ETxx and TKNO.

However, endpoints that are not linked to a specific concentration, e.g., LDxx, are not associated with an exposure number because the observed result is based on a calculated rather than an observed dose. These endpoints are linked with a placeholding Dose ID and Dose Number. The linkage is noted by E in the DOSE ID data field and the associated DOSE NO. in the EXPOSURE information. Refer to Table 5, Results Information, for coding examples.

In contrast, NOEC/NOELs and LOEC/LOELs are the endpoints used to represent a statistically significant range within the tested concentrations. The NOEC/NOEL is the highest tested concentration having no statistically significant adverse effect and the LOEC/LOEL is the lowest tested concentration having a statistically significant adverse effect. (Rand 1995) NOEC/NOELs and LOEC/LOELs are also linked by the place holding exposure number, as indicated in the previous paragraph.

For endpoints of ETXX or LTXX, code both the observation duration and the observed response value with the same values.

Result Set (R)

This field is used to link effects and endpoints together for data output display. The default entry for this field is -1. Enter positive integers for each specific effect/endpoint linkage. For example, a mortality data table and an LD50 as well as a body weight growth table and an EC50 are reported. Code all of the mortality data table and the LD50 with a '1' in the R data field and code '2' in the R data field for the growth and EC50 data. If there are endpoints without data or vice versa, code '-1' in the R data field. See Table 6, for examples.

Statistical analysis (STAT)

The statistical analysis or STAT data field is coded with SIG or NSIG if the author has presented statistical analysis of the test result as compared to the controls. As a general rule, if statistics are presented in the publication, assume that the exposure treatments were compared to the control. Statistical tests that measure differences between treatments are not coded. See Tables 7 and 8 for coding examples.

When statistical comparisons are presented for multiple controls (e.g., statistics in relation to a standard and solvent control), both sets of results are coded. In these instances, note the specific type of control used in the statistical analysis in the Remarks section.

The STAT data field is coded as "NR" for records having an endpoint of LCxx, ECxx, LTxx, BAF, ETxx, ICxx, LDxx. For NOEC/NOEL, LOEC/LOEL and statistically analyzed effects results without endpoints, code the significance as reported by the author(s), or 'NR' if statistical results are not presented in the publication.

If the author states that there is a 'statistically significant' increase or decrease in an observed effect (whether or not they report the statistical method used) but does not report a level of statistical significance level or identify a method of statistical analysis, code 'SIG' or 'NSIG' and 'NR' in LEVEL field. If the author states there is a significant increase or decrease in an observed effect but does not say it is "statistically significant," code 'NR' in the STAT data field.

Note: For concurrent control results, there should be no STAT or LEVEL defined. Statistical significance is compared to the control values.

Note: Coding statistics from least square differences (LSD).
If a paper presents data in the following format, determine the statistical significance by the following calculation.

Dose	Response
Control 1	2.4
Dose 2	4.6
Dose 3	4.8
Dose 4	6.7
LSD(0.05)	1.1

Subtract or add the LSD value (1.1) to the control value to get the lowest value that is significantly different. In this example, anything above 3.5 or below 1.3 is a significant value at the p=0.05 level. Therefore, all doses are significantly different from the control because they are all greater than 3.5).

p-Value (LEVEL)

The level of significance (e.g. test statistic) is coded when the author has reported statistical analysis in the test result. Terminology for significance level may be presented as: p =; p< or alpha value; $?^2$. The terminology are equivalent and are generally in the range of 0.001 to 0.10. See Tables 7 & 8 for coding examples.

The LEVEL data field is coded as reported by the author. If endpoints of LCxx, ECxx, LTxx, BAF, ETxx, ICxx, Ldxx report confidence intervals/limits, etc., report the significance level, e.g., 95% CI is coded as 0.05, in the LEVEL field.

P or R (Paper/Reviewer Assigned Data)

The PR data field is used to identify the source of the effect or endpoint information. If the effect or endpoint was reported by the author in the publication a 'P' is coded in the PR data field; if the effect or endpoint was assigned by the reviewer, an 'R' is coded. See Tables 7 & 8 for coding examples. Endpoints calculated by the author must be specifically identified, i.e., LD50, LT50 or NOEL/NOEC (see Appendix T for endpoint codes and definitions).

Reviewers will follow these guidelines in *assigning* endpoints:

1. BY DEFINITION: If the author does not actually state that the value is an LD50 but states that 'concentration x is the dose estimated to be lethal to 50% of the test organisms', the reviewer should code this as an LD50 endpoint because the author *defines* the LD50. Such a designation is accompanied by noting 'R' in the PR data field.

2. When the author provides text which identifies a value as the 'highest tested concentration having no statistically significant adverse effect', the reviewer should code this as a NOEL/NOEC ; the 'lowest tested concentration having a statistically significant adverse effect' should be coded as a LOEL/LOEC . In both cases, the PR field will be coded as 'R' to reflect reviewer assignment of an endpoint. Because LOEL/NOEL values are assigned under very specific experimental and

statistical conditions, TERRETOX reviewers will be assigning complementary NOELs or LOELs only when the author assigns either a LOEL or NOEL.

3. When the author provides statistical information, which designates concentrations as significantly different from the control, the reviewer will code this information as SIG or NSIG. The reviewer will also report the level of significance in the LEVEL data p-value in the p-value field.

Table 7. Coding Statistical and Endpoint Data Directly from a Table.

"The data from our experiments is shown in the following table."

#	Conc ug/g	Survival %	Stat sig p<0.05	Calc Endpt
C1	0	97	NR	NR
D2	7	97	NSIG	NR
D3	15	75	NSIG	NOEL
D4	30	26	SIG	LOEL
D5	50	0	SIG	NR

In this example, the raw data table is coded as follows:

DOSE	EFFECT	MEASMENT	ENDPT	R	STAT	LEVEL	P R
C1	MOR	SURV	NR	1	NR	NR	P
D2	MOR	SURV	NR	1	NSIG	p<0.05	P
D3	MOR	SURV	NR	1	NSIG	p<0.05	P
D4	MOR	SURV	NR	1	SIG	p<0.05	P
D5	MOR	SURV	NR	1	SIG	p<0.05	P
E6	MOR	SURV	NOEL	1	NSIG	p<0.05	P
E6	MOR	SURV	LOEL	1	SIG	p<0.05	P

Table 8. Coding Statistical Data Directly from a Table with a Reviewer Assigned Endpoint.

"The data from our experiments, in Table Z, shows that the concentration that had no observable effect on mortality was 7 ug/g."

Table Z: Mortality of Eisenia foetida to copper		
#	Conc ug/g	Survival %
C1	0	97
D2	7	97
D3	15	75
D4	30	26
D5	50	0

In this example, the table is coded as follows:

DOSE	EFFECT	MEASMENT	ENDPT	R	STAT	LEVEL	P R
C1	MOR	SURV	NR	1	NR	NR	P
D2	MOR	SURV	NR	1	NR	NR	P
D3	MOR	SURV	NR	1	NR	NR	P
D4	MOR	SURV	NR	1	NR	NR	P
D5	MOR	SURV	NR	1	NR	NR	P
E6	MOR	SURV	NOEL	1	NSIG	NR	R
E6	MOR	SURV	LOEL	1	SIG	NR	R

Standard methods recommend that when determining a NOEL/LOEL, at least three exposure concentrations be used (Menzer 1994 at 1406);. If the *author* uses only one exposure concentration AND assigns a NOEL/LOEL or SIG/NSIG result, a Remark noting "only conc tested" will be coded.

Response Site (SITE)

The specific site at which an effect measurement was observed is coded in the SITE data field, e.g. for residues (RSDE) recorded in the "liver," enter 'LI' in the SITE data field (see Appendix U for applicable codes). Response site is valid entry for GRO, AEG, CEL, PHY, DVP, GEN, REP, HIS, ENZ, BCM, HRM, INJ, MPH and ACC effect groups (see Appendix S for effect group and measurement codes). If a response site is not reported or not applicable, e.g. mortality, behavioral effects, code the site as Not Reported (NR).

Observed Response Value/Unit: , Mean, Range, Statistical Method (SM), Value, Unit (Mean, Range, SM, Value, Unit)

Enter the greater than (>), less than (<), minus (-) or approximation (~)symbols, if reported, as used by the author(s) to describe the response value preceding the MEAN or RANGE data field entries.

Report the mean or single observed response value, as reported in the publication, in the MEAN data field. When individual response values are reported along with a sum of all values, report each individual response value as well as the sum/total value on separate result lines.

Report the range or confidence (or fiducial) intervals (or limits) of the response value in the RANGE data field. The type of data stored in the RANGE data field will be identified in the SM data field (e.g., Data reported as a range (with a mean) or confidence interval (with an endpoint) will be specifically identified in the SM field. It is also assumed that the confidence interval is calculated at 95% and is noted in the LEVEL data field.

When the measurement unit includes a standard deviation (SD) or standard error (SE), specifically identify these types of ranges in the SM data field. Report the numeric value of the standard deviation or standard error in the VALUE data field.

Report the measurement unit which corresponds to the MEAN and/or RANGE entry in the UNIT data field (see Appendix N for standard units).

Refer to Table 6 in Results Information for coded examples. Table 6a. provides a standard deviation example, Table 6b. provides an example of a range, and Table 6c. provides a confidence interval example.

Dry or Wet Weight (DW%)
Record whether the residue/bioconcentration/bioaccumulation or growth data are reported on a dry or wet weight basis in the DW% data field. If percent moisture is reported, record the percentage value also, e.g. W75%.

Percent Lipid (%LPD)
If percent lipid information is provided in the publication, record as a % value in the %LPD data field. If the data are not reported in the publication, code as 'NR'.

Rank (RANK)
Following assessment by EcoSSL (Ecological Soil Screening Levels) Evaluation Criteria, this field will be marked for each test result for each publication to indicate the Evaluation Criteria Score and selected benchmark value ranking for determining the EcoSSL value.

Remark Number/Remarks (RN/REMARKS)
When there are remarks for a specific test, the REMARKS field as well as the Remark Number (RN) field, will be used. The Remark Number field is used to link the remarks associated with each specific test result. Each unique Remark is assigned a Remarks Number and only one Remark Number is used per result entry. Use a unique Remark Number for each section of the database, i.e., do not carry over Remarks or Remark Numbers from the Exposure Information to the Results Information sections. Remarks are preceded by the Remarks Number and identified by the field abbreviation listed in Attachment C. Refer to Table 6 for coding examples.

General Coding Information

Q. What is encoded from a publication?
A. All quantitative data are encoded from the publication. Each data point from tables, text and graphs is coded. Graphical data may be coded as ranges (1 result for the control and 1 result for all of the doses), unless statistical analysis is performed. Graphed data should be reported by using <, > or ~ values. These values must be the values noted by the axis marks from the graph. If duplicate results are reported in text and tabular format, note in the margin of the paper that the text information was coded from Table N. Non-quantitative data are noted in the general remarks section.

Q. Are abstractors allowed to interpret results from publications?
A. All information from a paper is abstracted using the author's terminology and numeric values. Exceptions to this include the expansion of exponential numbers and when the author's "words" match the standard definition effects and endpoints. If an endpoint is "interpreted" by an abstractor, it is noted by an 'R' in the ASSIGNED P/R data field.

Q. How and why are comments made?
A. In general, comments are used to better define or capture the researcher's intent. THESE ARE USED SPARINGLY. Comments are linked to coded fields by an identifier in the appropriate comments field (Organism, Exposure, Soil, General or Results information/remarks data fields). For example, a RESPONSE VALUE comment of median LC50 is located in Result remarks data field as Rvalue/median LC50//. Some comments are not linked to a specific data field (i.e. exposure temperature or in vitro studies). These comments are also noted in the appropriate comments field (i.e. exposure temperature in Exposure information and in vitro in the general remarks data fields).

Q. Is anything written in the original paper by the data abstractors?
A. Abstractors should note any comments about abstraction in the margins or on the tables/graphs of the original paper. This would include the Test ID Number for each unique test design, reason for data not being coded, LD50s outside of confidence intervals, errors between text and tables, or other anomalies.

Q. What happens if an endpoint is outside the confidence interval/limit or text and tabular or text and abstract data points differ?
A. The abstractor encodes only the endpoint value and notes that the range was not coded in the original publication. Textual information is used over all other data, unless the value is noted in another section of the paper. Then, the most frequent value is encoded.

TERRETOX CODING GUIDELINE
LIST OF ATTACHMENTS

ATTACHMENTS

ATTACHMENT A: TERRETOX CODING SHEET (SEPTEMBER 20, 1999)

TID _____

CHEMICAL | GRADE | FORMULATION | CHARACTERISTICS | RADIO LABEL | CAS NUMBER

1. TEST _____
2. POSTIVE CONTROL / CARRIER _____
3. POSTIVE CONTROL / CARRIER _____

REFERENCE #, AUTHOR, YEAR _____ TOTAL TESTS _____ Reviewer _____ Review Date ___/___/___ QA DATE ___/___/___ INITIALS _____

TEST INFORMATION

SPECIES LATIN/COMMON NAME	
SPECIES NUMBER	
ORGANISM SOURCE	
LIFESTAGE / AGE	
ORGANISM	
TEST LOCATION	
EXPOSURE TYPE	
EXPOSURE DURATION	
STUDY DURATION	
CONTROL TYPE	
DOSE NUMBER	
APPLICATION FREQUENCY	
EXPOSURE MEDIA	
SOIL TYPE	
SOIL TEXTURE	SA _____ % SI _____ % CL _____ %
SOIL PH	
SOIL ORGANIC MATTER	
SOIL MOISTURE (%)	
SOIL CEC	
SOIL CONC MEASURED (Y/N)/ DRY - WET WEIGHT	

REMARKS

SPECIES INFO

EXPOSURE INFO

SOIL INFO

EXPOSURE INFORMATION

DOSE ID	DOSE NO.	N	SEX	DOSE UNIT	SM	VALUE		ION	M/U	RN

GENERAL REMARKS

RESULTS INFORMATION _____ REFERENCE NUMBER _____ CAS # _____ TID _____

LOC #	DSE #	SMP # UNITS		OBSRV DUR	EFFECT	MEASURE MENT	END POINT	R	SIG/ NSIG	LEVEL	PR	SITE	OBSERVED RESPONSE VALUE/UNIT					DW %	%LPD	RANK	RN	REMARKS
													MEAN	RANGE		S MTD	VALUE	UNITS				
1														-								
														-								
3														-								
														-								
5														-								
														-								
7														-								
														-								
9														-								
														-								
11														-								
														-								
13														-								
														-								

Attachment B. TERRETOX Methods References

American Society for Testing and Materials. 1996. E 555-95 Standard Practice for Determining Acute Oral LD50 for Testing Vertebrate Control Agents. In: Annual Book of Standards, Section 11. Water and Environmental Technology, Vol. 11.05 Biological Effects and Environmental Fate; Biotechnology; Pesticides:109-110. [replaces E 555-75]

American Society for Testing and Materials. 1996. E 857-87 Standard Practice for Conducting Subacute Dietary Toxicity Tests with Avian Species. In: Annual Book of Standards, Section 11. Water and Environmental Technology, Vol. 11.05 Biological Effects and Environmental Fate; Biotechnology; Pesticides:278-282. [replaces E 857-81]

American Society for Testing and Materials. 1996. E 1062-86 Standard Practice for Conducting Reproductive Studies with Avian Species. In: Annual Book of Standards, Section 11. Water and Environmental Technology, Vol. 11.05 Biological Effects and Environmental Fate; Biotechnology; Pesticides:418-428.

Casarett, L.J., J.Doull, C.D.Klassen, and M.O.Amdur. 1986. Casarett and Doull's Toxicology. The Basic Science of Poisons. Third Edition, Macmillan Publishing Co., Inc., NY [classic toxicology textbook]

Hill, B.H. 1997. Aquatic plant communities for impact monitoring and assessment. Chapter Ten IN: W.Wang, J.W.Gorsuch, and J.S.Hughes (Eds), Plants for Environmental Studies, CRC Lewis Publishers: 277-305. [excellent overview]

Hoffman, D.J. 1995. Wildlife Toxicity Testing. In: D.J.Hoffman, B.A.Rattner, G.A.Burton,Jr., and J.Cairns,Jr. (Eds), Handbook of Ecotoxicology. CRC Press, Inc., Boca Raton, FL:47-69. [good overview of wildlife toxicity testing methods]

Hoffman,D.J., B.A.Rattner, G.A.Burton,Jr., and J.Cairns,Jr. (Eds) 1995. Handbook of Ecotoxicology. CRC Press, Inc., Boca Raton, FL [general reference with chapters on ecotoxicological effects, specific contaminant sources and effects, case histories, predictive ecotoxicology and risk assessment]

Lewis, M.A. and W. Wang. 1997. Water quality and aquatic plants. Chapter Six IN: W.Wang, J.W.Gorsuch, and J.S.Hughes (Eds), Plants for Environmental Studies, CRC Lewis Publishers: 142-175. [excellent overview]

Menzer, R.E., M.A. Lewis and A.Fairbrother. 1994. Methods in Environmental Toxicology. Chapter 38 In: W. Hayes (Ed), Principles and Methods of Toxicology, Third Edition, Raven Press, NY:1391-1418. [excellent overview of aquatic and terrestrial (plant and animal) methods]

Schaeffer, D.J. 1991. A Toxicological Perspective on Ecosystem Characteristics to Track Sustainable Development. Ecotoxicol. Environ. Saf. 22:225-239. [provides a general overview of toxicological and ecosystem endpoints]

US Environmental Protection Agency. 1988. Guidance Document for Conducting Terrestrial Field Studies. EPA-540/09-88-109, Office of Pesticide Programs, Washington, DC

US Environmental Protection Agency. 1986. Hazard Evaluation Division, Standard Evaluation Procedure, Avian Reproduction Test. EPA-540/9-86-139, Office of Pesticide Programs, Washington, DC [general info, no specific requirements provided]

US Environmental Protection Agency. 1986. Hazard Evaluation Division, Standard Evaluation Procedure, Field Testing for Pollinators. EPA-540/9-86-140, Office of Pesticides Programs, Washington, DC

US Environmental Protection Agency. 1985. Hazard Evaluation Division, Standard Evaluation Procedure, Honey Bee - Acute Contact LD50. EPA-540/9-85-002, Office of Pesticides Programs, Washington, DC

US Environmental Protection Agency. 1985. Hazard Evaluation Division, Standard Evaluation Procedure, Honey Bee - Toxicity of Residues on Foliage. EPA-540/9-85-003, Office of Pesticides Programs, Washington, DC

US Environmental Protection Agency. 1985. Hazard Evaluation Division, Standard Evaluation Procedure, Wild Mammal Toxicity Test. EPA-540/9-85-004, Office of Pesticide Programs, Washington, DC

US Environmental Protection Agency. 1985. Hazard Evaluation Division, Standard Evaluation Procedure, Avian Single-Dose Oral LD50. EPA-540/9-85-007, Office of Pesticide Programs, Washington, DC

US Environmental Protection Agency. 1985. Hazard Evaluation Division, Standard Evaluation Procedure, Avian Dietary LC50 Test. EPA-540/9-85-008, Office of Pesticide Programs, Washington, DC

US Environmental Protection Agency. 1982. Pesticide Assessment Guidelines Subdivision L Hazard Evaluation: Nontarget Insects. EPA-540/9-82-019, Office of Pesticides and Toxic Substances, Washington, DC

US Environmental Protection Agency. 1982. Pesticide Assessment Guidelines Subdivision E, Hazard Evaluation: Wildlife and Aquatic Organisms. EPA-540/9-82-024, Office of Pesticide Programs, Washington, DC [overview of EPA standard methods for terrestrial and aquatic, laboratory and field, pesticide exposures]

US Environmental Protection Agency. 1996. Proposed Guidelines for Ecological Risk Assessment, Risk Assessment Forum, EPA/630/R-95/002B, US EPA, Washington, DC [on order from US EPA 7/97)

Wang,W., J.W.Gorsuch, and J.S.Hughes (Eds). 1997. Plants for Environmental Studies, CRC Lewis Publishers:563 pp. [excellent overview]

Attachment C. Field Name Codes

I. Quality Assurance Parameters

Field Name	Coding Sheet Abbreviation	Remarks Abbreviation
Reference Number	REF #, AUTHOR, YEAR	none
Total Tests	TOTAL TESTS	none
Reviewer/Date	REVIEWER, DATE	none
QA Date/Initials	QA DATE, INITIALS	none
Test ID	TEST ID	none

II. Test Chemical Parameters

Field Name	Coding Sheet Abbreviation	Remarks Abbreviations
Chemical Name, Type	TEST, POSITIVE CONTROL, CARRIER	none, PC CARRIER
Grade	GRADE	GRADE
Formulation	FORMULATION	FO
Characteristics	CHARACTERSTICS	CHAR
Radiolabel	RADIOLAB	RADIO
CAS number	CAS #	none

III. Test Information

Field Name	Coding Sheet Abbreviation	Remarks Abbreviations
Species Number/Latin Name	SPECIES #/LATIN NAME	none
Organism Source	ORG SOURCE	SOURCE
Lifestage/Age	LIFESTG/AGE	LIFESTG/ AGE
Organism Characteristics	ORG CHAR	OCHAR
Test Location	TEST LOCATION	LOC
Exposure Type	EXPO TYPE	TYPE
Control	CONTROL	CONTR
Dose Number	DOSE NUM	DNUM
Application Frequency	APP FREQ	AP FREQ
Remarks	REMARKS	none
Experimental Design	---	EDES
Other Effects	none	OEF

IV. Exposure Information

Field Name	Coding Sheet Abbreviation	Remarks Abbreviation
Dose Number	DOSE #	none
Sample Number	N	none
Sex	SEX	SEX
Exposure Dose and Unit	DOSE/UNIT	DOSE/ DUNIT
Chemical Analysis Method	METHOD	ANALYSIS
Remark Number	RN	none
Remarks	REMARKS	none

V. Results Information

Field Name	Coding Sheet Abbreviation	Remarks Abbreviation
Dose Number	DOSE #	none
Sample Number and Unit	N/UNIT	SAMPN/ NUNIT
Exposure Time	E	ETIME
Observation Time	O	OTIME
Study Duration	S	STIME
Effect	EFFECT	EFCT
Measurement	MEASMENT	MSMT
Endpoint/Assigned	ENDPT/ASG	ENDPT
Response Site	RESP SITE	RSITE
Observed Response Value/ Unit	OBSERV RESPONSE VALUE/UNIT	RVALUE RUNIT
Dry or Wet Weight	DW %	DW
Percent Lipid	%LIPID	LD
Remark Number	RN	none
Remarks	REMARKS	none

TERRESTRIAL PLANT AND WILDLIFE TOXIC EFFECTS DATABASE (TERRETOX)
CODING GUIDELINE LIST OF APPENDICES

APPENDICES

Appendix A. Carrier CAS Numbers

Chemical Name	CAS #
Acetate	71501
Acetic acid	64197
Acetone (2-Propanone)	67641
Acetonitrile	75058
Aerosol OT (Sodium salt)	577117
Agar	9002180
Arachis oil	8002037
Butyl dioxitol	112345
Benzene	71432
Cadmium Chloride	10108642
Cadmium Sulfate	10124364
Cod Liver Oil	8001692
Cottonseed Oil	8001294
Corn Oil	8001307
Cornstarch	9005258
Cyclosol 63	89072606
Diesel oil	68334305
1,4-Dioxane	123911
DMF, N,N-Dimethylformamide	68122
DMSO, Dimethyl Sulfoxide	67685
Emulphor	9004982
Ethanol (or Ethyl alcohol - absolute alcohol)	64175
Ether	60297
2-Ethoxyethanol	110805
Ethylene Glycol Monomethyl Ether (2-Methoxyethanol)	109864
Fish Oil	8016135
Fuel Oil	68476299
Gelatin	9000708
Gum acacia	9000015
Gum tragacanth	9000651
HCL, Hydrochloric Acid	7647010
Hexane (also, N-Hexane)	110543
HNO3, Nitric Acid (HNO3; H2SO4,R)-Purity Character (Sulphuric Acid,R)	7697372
Isopropanol (2-Propanol)	67630
Iron Sulfates	10124499
Lactose	63423
Methanol (Methyl alcohol) (CH30H)	67561
Methoxyethanol (or 2-Methoxyethanol)	109864
Methylcellulose	9004675
Methylene Chloride	75092
Methyl ethyl ketone	78933
Mineral oil	8012951
NAHCO3, Sodium Bicarbonate	144558
NAOH, Sodium Hydroxide	1310732
N,N-Dimethylformamide (or Dimethylformamide)	68122
Nitric Acid	7697372
Olive Oil	8001250
Peanut Oil	8002037
Pentane	109660
Petroleum ether	8030306
Polyethylene Glycol (2-Propanol)	25322683
Polysorbate 80 (Tween 80)	809005656
Potassium Hydroxide (KOH)	1310583
Propane (Propylene glycol)	57556
2-Propanol Isopropanol (or Isopropanol)-Isopropyl alcohol	67630
Propylene Glycol	57556
Safflower Oil	8001238
Saline	7647145
Salt	7647145
Sesame Seed Oil	8008740

Sodium Chloride (Salt, Saline)(Na Cl)	7647145
Sodium Sulfate	7757826
Soybean Oil	8001227
Starch	9005258
Sucrose	57501
Sulfuric Acid	7664939
Sunflower Oil	8001216
Tergitol NPX	9016459
Toluene (or Methylbenzene)	108883
Toxisol FLC	12738920
Trichloroacetic Acid	76039
Triethylene Glycol	112276
Trimethylene Glycol	504632
Trioactanoin	538238
Triton-X100	9002931
Tween 40	9005667
Tween 80 (Polysorbate 80)	9005656
Water	7732185
Vegetable oil	68956683
Velsicol	2307495
Xylene	1330207

Appendix B. Chemical Grade Codes

ACS	American Chemical Society Grade
AN	Analar Grade
AL	Analysis Grade
A	Analytical Grade
AR	A.R. Grade
B	Biological Grade
CG	Chemical Grade
CH	Chromatographic Grade
C	Commercial Grade
EM	Eastman Grade
EL	Electrophoresis Grade
F	Field Grade
GU	Guaranteed Grade
GUR	Guaranteed Reagant Grade
HPLC	High Performance Liquid Chromatography Grade
HG	Histological Grade
I	Industrial Grade
L	Laboratory Grade
MK	Merck Grade
ME	Monsanto Electrical Grade
NAF	National Formulary Grade
NR	Not Reported
OP	Optima
PAN	Pestanal Grade
PST	Pesticide Grade
PH	Pharmaceutical Grade
PRA	Practical Grade
PR	Production Grade
PG	Pure Grade
PFG	Purified Grade
R	Reagent Grade
RFG	Reference Grade
RE	Research Grade
RE or A	Research or Analytical Grade
RS	Residue Grade
SC	Scintillation Grade
SO	Solvent Grade
S	Spectrophotometric Grade
TA	Technical Acid Grade
T	Technical Grade
ULV	ULV Grade
UP	Ultrapure Grade
USP	United States Pharmacopeia Grade

Appendix C. Chemical Formulation Codes

AE	Acid Equivalent
AI	Active Ingredient
ASG	Agricultural Suspension
ARST	Analytical Reference Standard
AQ	Aqueous Solution
AS	Aqueous Suspension
AAPS	Atomic Absorption Primary Standard
CP	Chemically Pure
CRI	Chromatographically Impure
CRP	Chromatographically Pure
C	Commercial
CO	Concentrate
CR	Controlled Release
CRY	Crystal
DC	Detached Crystals
DG	Dispersable Granule (also known as “dry flowable”)
DP	Dispersable Powder
D	Dust
EC	Emulsifiable Concentrate
EF	Emulsifiable Formulation
ES	Emulsifiable Solution, Agent
EG	Emulsified Granular
E	Emulsion
EN	Encapsulated
FFO	Field Formulated
FCASS	Fisher Certified Atomic Absorption Standard
FK	Flake
FF	Flowable Formulation
FG	Finely Ground
FO	Formulated
GCR	Gas Chromatograph Standard
GS	Gaseous
G	Granule, Granular
GU	Guaranteed
HG	Heavy Granular
LD	Liquid
LDCO	Liquid concentrate
N	Nanograde
ND	Neutralized, Desensitized
NF	Nonionized Form
NR	Not Reported
ODA	Organic Dispersal Agent
PAR	Particulate
PEL	Pellet
PO	Powder
PRE	Prepared in Lab
PS	Primary Standard
PA	Pro Analsi Quality
PU	Pure, Purissium or Puris
PF	Purified
RC	Recrystallized
RST	Reference Standard
RF	Registered Formulation
S	Solution
SO	Soluble Concentrate
SP	Soluble Powder
SPL	Spray Liquid
SPO	Spray Powder
ST	Standard
STD	Standard Solution for AA
UD	Unneutralized, Desensitized
WMC	Water Miscible Concentrate
WS	Water Soluble
WSC	Water Soluble Concentrate
WP	Wettable Powder
WHO	World Health Organization
W/W	Weight per weight

Appendix D. Radiolabel Isotope Codes

Ag-110	Silver
Am-241	Americium
As-74	Arsenic
Be-7	Beryllium
C-14	Carbon
Cd-109	Cadmium
Cd-115	Cadmium
Cl-36	Chlorine
Cm-244	Curium
Co-60	Cobalt
Co-64	Cobalt
Co-57	Cobalt
Cr-51	Chromium
Cs-137	Cesium
Cs-134	Cesium
Cu-64	Copper
Cu-63	Copper
Cu-65	Copper
Eu-152	Europium
F-18	Fluorine
I-131	Iodine
Fe-59	Iron
H-3	Hydrogen (Tritium)
Hg-197	Mercury
Hg-203	Mercury
I-125	Iodine
Mn-54	Manganese
N-15	Nitrogen
Ni-63	Nickel
Np-235	Neptunium
NR	Not Reported
P-32	Phosphorus
Pb-210	Lead
Pb-203	Lead
Pu-239	Plutonium
Pu-237	Plutonium
Ra-226	Radium
S-35	Sulfur
Sb-125	Antinomy
Se-75	Selenium
Sn-113	Tin
Sr-90	Strontium
Sr-85	Strontium
Tc-95	Techninium
Te-128	Tellurium
Th-232	Thorium
Th 238	Thorium
U-238	Uranium
U-232	Uranium
U-235	Uranium
V-48	Vanadium
V-49	Vanadium
Zn-65	Zinc

Appendix E. Organism Source Codes

CODE	DEFINITION
CBC	**C**aptive **b**reeding **c**olony
COM	**Com**mercial source
DOM	**Dom**estic strain
GAM	**Gam**e farm strain
GOV	**Gov**ernment agency source
LAB	**Lab**oratory strain
MLT	**M**u**lt**iple Sources
NR	**N**ot **r**eported
WLD	**Wild** strain

Appendix F. Lifestage Codes (at beginning of exposure)

I. Organism lifestage codes

CODE	DEFINITION
AD	Adult
CC	Cocoon
EG	Egg
EM	Embryo
IM	Immature
JV	Juvenile; fledgling, hatchling, weanling
LV	Larvae
MA	Mature
MU	Multiple
NR	Not reported, unknown
PU	Pupa
SA	Subadult
SI	Sexually immature
SM	Sexually mature
SP	Sperm
VI	Virgin
YO	Young

II. Plant lifestage codes

Code	Definition
FB	Mature, full-bloom stage (fruit trees)
FG	Female gametophyte
GS	Germinated seed
MD	Mature dormant
MG	Male gametophyte
MU	Code as MU
MT	Mature, no specified stage
PB	Mature, post-bloom stage (fruit trees)
PH	Mature, pit-hardening stage (fruit trees)
RP	Mature reproductive
SD	Seed
SG	Mature, side-green stage (fruit trees)
SL	Seedling
TC	Tissue culture callus
VG	Mature vegetative

Appendix G. Soil Type Codes

Standard Artificial Soils:

OECD 1984	Organization for Economic Cooperation and Development 1984
OECD 1993	Organization for Economic Cooperation and Development 1993
EEC	Council of European Communities
ISO 1994	International Standard Organization 1994

Appendix H. Test Location Codes

CODES	DEFINITIONS
FieldA	**Field, A**rtificial - a simulated or artificial field study is conducted in "an artificially bounded system that is a simplification of a specific ecosystem", e.g. aviaries, pens, enclosures, outdoor pots
FieldN	**Field, N**atural - a natural field study is one "in which both the test system [...] and exposure to the stressor are "naturally" derived"; e.g. sprayed agricultural field or orchard plots, field surveys
FieldU	**Field, U**nable to determine whether natural or artificial setting
Lab	**Lab**oratory indoor setting, including environmental chamber, greenhouse, lath house, garden frame or indoor pots
NR	**N**ot **R**eported; unable to determine whether laboratory or field

Appendix I. Valid Duration Units

CODE	DEFINITION
s	**s**econd
mi	**mi**nute
h	**h**our
d	**d**ay
wk	**w**eek
mo	**mo**nth
yr	**y**ea**r**
lf	**li**fetime;no associated numeric value
NR	time information **n**ot **r**eported
bt	to **b**oot s**t**age
cfs	to **c**ommercial **f**lower **s**tage 10/20/99
ea	to **ea**ring
eslk	to **e**arly **s**i**lk** stage
em	to **em**ergence
f5	**5**0% **f**lowering
fi	**f**lower **i**nitiation
fr	to **fr**uit stage
gm	to **g**er**m**ination
gs	**g**rowing **s**eason
hv	**h**ar**v**est
ht	until **h**a**t**ch
it	**i**ntermolt to mol**t**
ls6	**6 l**eaf **s**tage
ls9	**9**-10 **l**eaf **s**tage
ma	to **ma**turity
pd	1st **p**o**d** set
pm	**p**ost **m**olt
rc	**r**eady for **c**onsumption
slk	to **s**i**lk** stage
tr	1st **tr**ifoliate leaf

CODE	DEFINITION
ts	time to **t**a**s**sle
zm	**z**oeae-**m**egalop
-n	negative values represent pretreatment times
-x	pretreatment response observation but time unknown
/	NOT TO BE USED AFTER 10/15/99, USE QUALITATIVE CODES (ABOVE) INSTEAD: used when the duration is qualitative rather than quantitative; information is recorded as text in the Remarks (eg., 12th egg after hatch but not end of study)

Appendix J. Exposure Type Codes

CODE	DEFINITION
D see Appendix J.1	**D**iet - exposure through consumption; includes diet and/or water intake; this code will be automatically assigned if one of the diet categories from Appendix J.1 is used
I see Appendix J.2	**I**njection -insertion of the toxicant into the skin, vessels, muscle, subcutaneous tissue, or any body cavity; this code will be automatically assigned if one of the injection categories from Appendix J.2 is used
M see Appendix J.3	**M**ultiple-exposure to the toxicant through two or more different routes.
N see Appendix J.4	I**n**halation - exposure to the toxicant through breathing; this code will be automatically assigned if one of the injection categories from Appendix J.3 is used
NR	Exposure type is **N**ot **R**eported
T see Appendix J.5	**T**opical - exposure includes dermal, eggshell, immersion or soaking; this code will be automatically assigned if one of the topical categories from Appendix J.4 is used
V see Appendix J.6	En**v**ironmental - exposure includes field insitu and specific application types as well as incidental exposures; this code will be automatically assigned if one of the environmental categories from Appendix J.5 is used

Appendix J.1 Diet (D) Exposure Codes

Code	Definition
DT	diet, unspecified
FD	chemical incorporated into the food
DR	chemical incorporated into the water
CH	choice of treated or untreated food or water
GV	gavage
OR	oral via capsule

Appendix J.2 Injection (I) Codes

Code	Definition
IJ	injection, unspecified
IG	intragastrical
IM	intramuscular
IP	intraperitoneal
IL	intraplacental
IR	intraprostomial
IS	intrasegmentally (insects)
IE	intratesticular
IT	intratracheal
IV	intravenous
SC	subcutaneous
YK	yolk

Appendix J.3 Multiple (M) Application Codes

Code	Definition
MU	multiple routes between application groups (e.g. dermal and inhalation)

Appendix J.4 Inhalation (N) Application Codes

Code	Definition
IH	inhalation

Appendix J.5 Topical (T) Application Codes

Code	Definition
DM	dermal
MM	immersion
OC	ocular
PC	percutaneous
SA	surface area dose
SH	eggshell
TP	topical, general

Appendix J.6 Environmental (V) Exposure Codes

Code	Definition
AG	aerial-granular
AS	aerial spray application
CM	culture medium application
DA	direct application
DU	dusted
DW	dropwise application
EN	environmental, unspecified
FS	foliar spray
FU	fumigation
GG	ground granular
GM	growth medium application
GS	ground spray
HP	hydroponic solution application
HS	hand spray
IN	in situ
MI	misted
MT	multiple routes within environmental exposures, eg. Aerial spray and soil slurry to the same plots.
PR	present in soil
PT	painted
PU	pump
SO	dipped or soaked
SP	spray
SS	soil slurry
WA	watered

Appendix K. Application Frequency Codes

APPLICATION FREQUENCY CODES	
CODE	**DEFINITION**
ADL	**Ad l**ibitum; without limit or restraint
CON	**Con**tinual; non-pulsed
DLY	**D**ai**ly**; dosing regime not specified
EOD	**E**very **o**ther **d**ay
X	Dosed **x** time(s) per study period; e.g. 1 time = 1X
X per h	**X** times **per h**our
X per d	**X** times **per d**ay
X per wk	**X** times **per w**eek
X per mo	**X** times **per m**onth
NR	**N**ot **R**eported

Appendix L. Exposure Media Codes

AGR = Agar
AQU = Aqueous
ART = Artificial soil
CUL = Culture Medium
FLT = Filter paper
HUM = Humus
HYP = Hydroponic
LIT = Litter
MAN = Manure
MIN = Mineral soil
MIX = Media Mixture (with comment)
NAT = Natural soil
NONE = No substrate
NR = Not reported
POP = Plaster of Paris
SLG = Sludge
UKS = Unspecified soil type

Appendix M. Control Type and Dose ID Codes

CODE	DEFINITION
B	**B**aseline or background control: parameters of actual or representative test species measured before and after administration of test chemical, though not as part of the same test scenario. **Note:** pretreatment values, collected during the same test scenario as the observed responses, are recorded as exposure concentrations with a negative exposure duration; not as baseline control parameters.
C	**C**oncurrent control: controls are run simultaneously with the exposure, e.g. in the laboratory where a chemical free test chamber is used or in field studies where the control data are obtained upstream from the exposure data; also includes field tests where the controls are run in a separate system, ie. pond A and pond B or field A and field B
D	Exposure **D**ose level identifier
E	**E**ndpoint link identifier
H	**H**istorical control: applicable to natural field system testing, data collected prior to exposure often during an independent long-term survey of the area; see also **B - B**aseline
K	Data for control is presented but without accompanying methodology to identify procedures used
M	**M**ultiple controls were reported, e.g. historic and concurrent
NR	**N**ot **r**eported; there is no information about presence or absence of controls in the publication
O	"**O**ther" controls are for use in aquatic studies only. The '**O**' code should be used when a control is run in a different system (defined by different dilution water) than the exposure treatments; ie., control from pond A and effect information from pond B. See also **C** for concurrent controls.
P	**P**ositive controls were used
V	Carrier or sol**v**ent; organisms exposed to carrier or solvent as the only control
Z	No controls were used in the study

Appendix N. Exposure Dose and Observation/Response Value Units

AI	active ingredient; followed by the unit, eg AI kg/ha
b/ml	billions per milliliter
bees/d	bees per day
bt/mi	beats per minute
BU	Bessey Units
cal/d	calories per day
castings	earthworm castings
cell/mi x10x3	cells per minute x10x3
cell/mm3	cells per cubic millimeter
cellx10x2/ul	cells x10x2 per microliter
C	Centigrade, degrees
cm	centimeter
cm2	centimeters squared
cm2/100bees	centimeters squared per 100 bees
cc	cocoons
d	day
degree	degree
dm2	decimeters squared
dpm	disintegrations per minute
dpm/g	disintegrations per minute per gram of tissue
dpm/800g soil	disintegrations per minute per 800 grams of soil
dpm/mg	disintegrations per minute per milligram
dpm/n	disintegrations per minute per N
e/100hd	eggs per 100 hen days
e/hd	eggs per hen day
e/org	eggs per organism
e/org/d	eggs per organism per day
e/org/wk	eggs per organism per week
enz act	enzyme activity
eq/l	equivalents per liter
EU/g	enzyme unit (ammount of enzyme needed to catalyze)/g
FER	feed efficiency ratio
fr	frames (bees)
g	grams
g%	gram percent
g/100l	grams per 100 liters
g/100g	grams per 100 grams
g/100ml	grams per 100 milliliters
g/100 sd	grams per 100 seeds
g/1000g	grams per 1000 grams
g/2500cm2	grams per 2500 centimeters squared
g/400m	grams per 400 meters
g/acre	grams per acre
g/bee	grams per bee
g/ctnr	grams per experimental container
g/d	grams per day
g/dl	grams per deciliter
g/eu	grams per experimental unit
g/g bdwt	grams per gram body weight
g/ha	grams per hectare
g/h	grams per hour
g/kg	grams per kilogram
g/kg/d	grams per kilogram per day
g/m2	grams per square meter
g/org	grams per organism
g/org/d	grams per organism per day
g/org/eu	grams per organism per experimental unit
g/quadrant	grams per quadrant
g/shell	grams per shell
h	hour
in2	inches squared
inclusion	internuclear inclusion body
IU	International Units
IU/l	International Units per liter
IU/mg	International Units per milligram
IU/orgwt	International Units per organ weight
jv	juveniles
jv/cc	juveniles per cocoon
jv/ftcc	juveniles per fertile cocoon
jv/org/wk	juveniles per organisms per week
K/ml	karmen units per milliliter
kcal	kilocalories
kg	kilograms
kg/d	kilograms per day
kg/ha	kilograms per hectare
KA/100ml	king/armstrong units per 100 milliliters
Kunit/ml	k unit per milliliter
lb	pounds
lb/acre	pounds per acre
lb/11 gal/acre	pound per 11 gallons per acre
log2	log squared
mat indx	maturity index
mM	milliMolar (millimoles per liter)
meq/L	milliequivalents per liter
mg	milligrams
mg$^{1/3}$	milligrams to 1/3 power
mg %	milligrams percent
mg pro/g	milligrams protein per gram
mg/%	milligrams per percent
mg/0/d	milligrams per organism per day
mg/100g	milligrams per 100 grams
mg/100ml	milligrams per 100 milliliters
mg/10g	milligrams per 10 grams
mg/454g	milligrams per 454 grams
mg/l	milligrams per liter
mg/bee	milligrams per bee
mg/cntr	milligrams per container
mg/cm2	milligrams per square centimeter
mg/d	milligrams per day
mg/dl	milligrams per deciliter
mg/eu	milligrams per experimental unit
mg/g	milligrams per gram
mg/g org	milligrams per gram of organism
mg/g pod	milligrams per gram of pod
mg/h	milligrams per hour
mg/kg	milligrams per kilogram
mg/kg/d	milligrams per kilogram per day
mg/m3	milligrams per cubic meter
mg/ml	milligrams per milliliter
mg/org	milligrams per organism
mg/org/d	milligrams per organism per day
mg/orwt	milligrams per organ weight
mg p/g	milligrams protein per gram

mi	minute
mi/d	minutes per day
ml	milliliters
ml/100g	milliliters per 100 grams
ml/cntr	milliters per container
ml/kg	milliliters per kilogram
ml/org/d	milliliters per organism per day
mm	millimeters
mm2	square millimeters
mm3	cubic millimeters
mmol/kg	millimoles per kilogram
mosmols/l	mosmoles (conc osmotic particles in solution) per liter
mp/mg pro/15mi	microsomal proteins/milligram protein per 15 minutes
mu	milliunits
mu/mg	milliunit per milligram
mu/mi/ml	milliunit per minute per milliliter
mu/ml	milliunit per milliliter
mo	month
ng	nanograms
ng/g	nanograms per gram
ng/kg	nanograms per kilogram
ng/mg	nanograms per milligram
ng/mg/mi	nanograms per milligram per minute
ng/ml	nanograms per milliliter
ng/ml/mi	nanograms per milliliter per minute
ng/org	nanograms per organism
ng/orwt	nanograms per organ weight
ng/ul	nanograms per microliter
nmol	nanomoles
nmol/l	nanomoles per liter
nmol/g	nanomoles per gram
nmol/g pro	nanomoles per gram protein
nmol/g pro/mi	nanomoles per gram per protein per minute
nmol/g/30mi	nanomoles per gram per 30 minutes
nmol/g/h	nanomoles per gram per hour
nmol/h/mg pro	nanomoles per hour per milligram protein
nmol/kg	nanomoles per kilogram
nmol/kg/mi	nanomoles per kilogram per minute
nmol/mg	nanomoles per milligram
nmol/mg pro	nanomoles per milligram per protein
nmol/mg pro/mi	nanomoles per milligram protein per minute
nmol/mg/20mi	nanomoles per milligram per 20 minutes
nmol/mg/mi	nanomoles per milligram per minute
nmol/mgpro/30mi	nanomoles per milligram protein per 30 minutes
nmol/mi/g	nanomoles per minute per gram
nmol/mi/mg pro	nanomoles per minute per milligram protein
nmol/mi/ml	nanomoles per minute per milliliter
nmol/mlpro/30mi	nanomoles per milliliter protein per 30 minutes
NA	not applicable
NR	not reported
no/m2	number per square meter
no/org	number per organism
no/panicle	number per panicle
org/100g soil	organisms per 100g soil
org/0.25ft2	organisms per 0.25 square feet
org/60 leaves	organisms per 60 leaves
org/g	organisms per gram
org/g soil	organisms per gram soil
org/mi	organisms per minute
org/plot	organisms per plot
org/km2	organisms per square kilometer
org/m2	organisms per square meter
org/samp	organisms per sample
org/site	organisms per site
org/trap	organisms per trap
org/tree	organisms per tree
OD/mg pro	optical density per milligram protein
Odx10x3	optical density x10x3
org	organism
%	percent
% of control	percent of control
% of initial	percent of initial quantity
% of max yld	percent of maximum yeild
%/g	percent per gram
%/ml	percent per milliliter
[% inhib]	[percent inhibition: % is unit, inhib is measurement]
% S/ppm Zn	percent sulfur per parts per million zinc
pc	permeability constant
pg	picograms
pg/cell	picograms per cell
pg/ml	picograms per milliliter
pmol/g	picomoles per gram
pmol/g/mi	picomoles per gram per minute
pmol/mg pro/mi	picomoles per milligram protein per minute
pmol/mg/mi	picomoles per milligram per minute
pmol/mg/h	picomoles per milligram per hour
ppb	parts per billion
ppm	parts per million
pt/ac	pints per acre
[RA]	[ratio: use the number, no unit needed]
RA/wk	ratio per week
RI	ratcliffe index (shell wt/egg length x width mm2)
t/ha gr/t/ha gr + str	tons per hectare grain over tons per hectare grains plus straw
tillers/m2	tillers per square meter
s	seconds
s/g	seconds per gram
s/h	seconds per hour
SFU	sigma frankel units
spp	species
u	units
u act	unit activity (an increase in absorbance at 555 nm of 0.100, with a 1.0 cm light path, per milliliter of erythrocytes per hour, at 38 C).
u/co2/50mg/10mi	units per carbon dioxide per 50 milligrams per 10 minutes
u/g	units per gram
u/l	units per liter
u/mg	units per milligram
u/ml	units per milliliter
u3	cubic microns
uM	microMolar (micromoles per liter)
ueq/l	microequivalents per liter
ueq/g	microequivalents per gram
ug	micrograms
ug/100mg/30mi	micrograms per 100 milligrams per 30 minutes
ug/100mg/h	micrograms per 100 milligrams per

	hour
ug/100ml	micrograms per 100 milliliters
ug/200mg/20mi	micrograms per 200 milligrams per 20 minutes
ug/200mg/30mi	micrograms per 200 milligrams per 30 minutes
ug/24h/org	micrograms per 24 hours per organism
ug/l	micrograms per liter
ug/bee	micrograms per bee
ug/cm2	micrograms per centimeter squared
ug/dl	micrograms per deciliter
ug/egg	micrograms per egg
ug/eu	micrograms per experimental unit
ug/g	micrograms per gram
ug/g soil	micrograms per gram soil
ug/g om	micrograms per gram organic matter
ug/g org	micrograms per gram organism
ug/g dry compost	micrograms per gram dry compost
ug/g tissue	micrograms per gram tissue
ug/kg	micrograms per kilogram
ug/mg	micrograms per milligram
ug/ml	micrograms per milliliter
ug chl/ mg leaf	micrograms chlorophyll per milligram of leaf
ug N/g	micrograms nitrogen per gram
ul	microliter
ul/egg	microliters per egg
um2	micromoles squared
um3	cubic micromoles
uM/cm3	micromoles per squared centimeter
uM/l	micromoles per liter
uM/min/g	micromoles per minute per gram
umol/10g/h	micromoles per 10 grams per hour
umol/10mg/h	micromoles per 10 milligrams per hour
umol/20mi/g	micromoles per 20 minutes per gram
umol/l	micromoles per liter
umol/g	micromoles per gram
umol/g soil	micromoles per gram soil
umol/g/h	micromoles per gram per hour
umol/g/mi	micromoles per gram per minute
umol/h/mg pro	micromoles per hour per milligram protein
umol/kg	micromoles per kilogram
umol/m	micromoles per meter
umol/mg	micromoles per milligram
umol/mg pro	micromoles per milligram protein
umol/mg/20mi	micromoles per milligram per 20 minutes
umol/mg/h	micromoles per milligram per hour
umol/mg/mi	micromoles per milligram per minute
umol/mi/g	micromoles per minute per gram
umol/mi/h	micrograms per minute per hour
umol/mi/mg pro	micromoles per minute per milligram protein
umol/ml/mi	micrograms per milliliter per minute
units/100ml	units per 100 milliliters
units/l	units per liter
uu/mg	microunits per milligram
uu/mi/ml	microunits per minute per milliliter
uu/ml	microunits per milliliter
V	response value
V/N	response value per number of response sites
V/quadrant	response value per quadrant
WER	water efficiency ratio
wk	week
[1/h]	[one per hour: use **/h**]
[10x2/mm3]	[10x2 cubic millimeters:use **/mm3**]
[10x3/mm3]	[10x3 cubic millimeters:use **/mm3**]
[10x6/ml3]	[10x6 cubic milliliters: use **/mm3**]
[10x6/mm3]	[10x6 cubic millimeters:use **/mm3**]
[10x6/ul]	[10x6 microliters:use **/ul**]
[10x9/l]	[10x9 liters:use **/l**]

Appendix O. Ion Codes

Actinium	Ac	Germanium	Ge	Praseodymium	Pr
Aluminum	Al	Gold	Au	Promethium	Pm
Americium	Am	Hafnium	Hf	Protactinium	Pa
Ammonia	(un-ionozed) NH_3	Helium	He	Radium	Ra
		Holmium	Ho	Radon	Rn
Ammonium	(total) NH_4	Hydrogen	H	Rhenium	Re
		Indium	In	Rhodium	Rh
Antimony	Sb	Iodine	I	Rubidium	Rb
Argon	Ar	Iridium	Ir	Ruthenium	Ru
Arsenic	As	Iron	Fe	Samarium	Sm
Astatine	At	Krypton	Kr	Scandium	Sc
Barium	Ba	Lanthanum	La	Selenium	Se
Berkelium	Bk	Lawrencium	Lr	Silicon	Si
Beryllium	Be	Lead	Pb	Silver	Ag
Bismuth	Bi	Lithium	Li	Sodium	Na
Boron	B	Lutetium	Lu	Strontium	Sr
Bromine	Br	Magnesium	Mg	Sulfur	S
Cadmium	Cd	Manganese	Mn	Tantalum	Ta
Calcium	Ca	Mendelevium	Md	Technetium	Tc
Californium	Cf	Mercury	Hg	Tellurium	Te
Carbon	C	Methylmercury	MeHg	Terbium	Tb
Cerium	Ce	Molybdenum	Mo	Thallium	Tl
Cesium	Cs	Neodymium	Nd	Thorium	Th
Chlorine	Cl	Neon	Ne	Thulium	Tm
Chromium	Cr	Neptunium	Np	Tin	Sn
Cobalt	Co	Nickel	Ni	Titanium	Ti
Copper	Cu	Niobium	Nb	Total Residual Bromine	TRBr
Curium	Cm	Nitrogen	N	Total Residual Chlorine	TRCl
Dysprosium	Dy	Nobelium	No	Uranium	U
Einsteinium	Es	Osmium	Os	Vanadium	V
Erbium	Er	Oxygen	O	Wolfram	W
Europium	Eu	Palladium	Pd	Xenon	Xe
Fermium	Fm	Phosphorus	P	Ytterbium	Yb
Fluorine	F	Platinum	Pt	Yttrium	Y
Francium	Fr	Plutonium	Pu	Zinc	Zn
Gadolinium	Gd	Polonium	Po	Zirconium	Zr
Gallium	Ga	Potassium	K		

Appendix P. Chemical Analysis Methods

CODE	DEFINITION
Measured	Exposure and/or observation concentrations or doses are quantitative; analysis methods may be reported; note that exposure concentrations may be analyzed but observations could be reported in terms of nominal, unmeasured values. This distinction must be noted when coding.
Unmeasured	Exposure and/or observation concentrations or doses are clearly identified as nominal values; or when the author does not report any information about whether the concentrations were measured or nominal, ie. unmeasured is used as a default value when there is no information provided about the chemical concentrations.
Calculated	Exposure and/or observation concentrations or doses are estimated through calculation rather than quantitative measurement.
Not **R**eported	Exposure and/or observation concentrations or doses are reported as both the measured and the unmeasured values but it is not clear whether the observation/response dose is a measured or nominal value.

Appendix Q. Sample Unit Codes for Section V.5. Results Information

CODE[1]	DEFINITION
AD	**Ad**ult
BH	**B**ot**h** male and female organisms exposed or observed
BR	**Br**ood
DC	**D**e**c**eased organism
EG	**Eg**g
EM	**Em**bryo
FB	Mature, **f**ull-**b**loom (fruit trees)
FF	**F**ields (as in agriculture)
FG	**F**emale **g**ametophyte
FM	**F**e**m**ale organisms
GS	**G**erminated **s**eed
HC	**H**oney **c**omb
HT	**Ha**t**c**hling
JV	**J**u**v**enile
MD	**M**ature **d**ormant
MG	**M**ale **g**ametophyte
ML	**M**a**l**e organisms
MT	**Ma**t**u**re, no specified stage
NR	Applicable information about the organisms was **N**ot **R**eported
NT	**N**es**t**
OR	**Or**ganism
PB	Mature, **p**ost-**b**loom (fruit trees)
PH	Mature, **p**it-**h**ardening (fruit trees)
PL	**P**lo**t**s
PR	**P**ai**r**
RB	Mature **r**eproductive, 2nd generation

CODE[1]	DEFINITION
RC	Mature **r**eproductive, 3rd generation
RP	Mature **rep**roductive
SC	2nd generation (M2), no spec.stage
SD	**S**ee**d**
SG	Mature, **s**ide-**g**reen (fruit trees)
SL	**S**eed**l**ing
SV	**S**ur**v**ivor
TC	**T**issue **c**ulture callus
VG	Mature **v**e**g**etative

Appendix R. Effect Group Codes and Definitions

GROUP/EFFECT CODE(S)	DEFINITION
ACC/ACC	**Acc**umulation: Effects, measurements and endpoints which characterize the process by which chemicals are taken into and stored in plants or animals. Includes lethal body burden.
BEH/AVO, BEH, FDB	**Beh**avior: Overt activity of an organism represented by three *effect* groups - avoidance, general behavior, and feeding behavior. All measurements related to reproductive behavior are listed under the major effect group REP.
BCM/BCM, ENZ, HRM,	**B**io**ch**e**m**ical: measurement of biotransformation or metabolism of chemical compounds, modes of toxic action, and biochemical responses in plants and animals including three *effect* groups - biochemical, enzyme and hormone effects.
CEL/CEL, GEN, HIS	**Cel**lular Effects: measurements and endpoints regarding changes in structure and chemical composition of cells and tissues of plants or animals as related to their functions; the three *effect* groups include cellular, genetic and histological effects.
GRO/DVP, GRO, MPH	**Gro**wth: a broad category which encompasses measures of weight and length and includes effects on development, growth and morphology. Development covers toxicant effects on tissue organization in growing progeny. Growth represents length and weight changes at any point in the life cycle. Morphology measurements and endpoints address the structure (bones) and form (organ/tissue development) of an organism at any stage of its life history.
MOR/MOR	**Mor**tality: measurements and endpoints where the cause of death is by direct action of the chemical.
PHY/INJ, IMM, ITX, PHY	**Phy**siology: measurements and endpoints regarding basic activity in cells and tissues of plants or animals. Four *effect* groups include injury, immunity, intoxication and general physiological response.
POP/POP	**Pop**ulation: measurements and endpoints relating to a group of organisms or plants of the same species occupying the same area at a given time.
REP/ REP, AEG	**Rep**roduction: measurements and endpoints to track the effect of toxicants on the reproductive cycle. All measurements related to reproduction and care of progeny are included in this category, including behavioral and physiological measurements. Measurements related to development of progeny are found under the major *effect* group GRO, minor *effect* group DVP. The *effect* group AEG includes measurements of avian or reptilian eggs.
SYS/PRS	Eco**sys**tem: measurements and endpoints to track the effects of toxicants on ecosystem processes. Includes microbial processes.
NOC/NOC	**No** Group **C**ode: measurements related to multiple or delayed effects or endpoints reported without a specific effect.

Appendix S. Group Effect, Effect and Measurement Codes and Definitions

ACC ACCUMULATION

ACC Effect
Measurements

BDBN body burden
BDCN body concentration
ELIM elimination; general term for loss or disappearance of a substance from an organism by either passive or active transport mechanism, e.g. diffusion and metabolic transformation. (Rand 1995)
GACC accumulation, general
LBCN lethal body concentration
RSDE residue
UPTK uptake; the fraction of total available chemical in a medium (food, water) that is transferred to the organism (measured as the incoming - outgoing concentrations) OR a process by which materials are transferred into and onto an organism. (Rand 1995)

BEH BEHAVIOR

AVO Effect
Measurements

CHEM chemical avoidance
FOOD food avoidance
GAVO avoidance, general
STIM stimulus avoidance
WATR water avoidance

BEH Effect
Measurements

ACTP accuracy of learned task, performance
ACTV activity, general
ATCL attennal cleaning
BBBH burrow or burial behavior
BWAX bees wax produced
CASE case leaving behavior
CMST compactness of swimming track
COMA colony maintenance (bees)
COMB comb built
DHST diameter of helix of swimming track
DPLY displaying behavior
DRMT dormant, adverse condition response
DTCH ability to detach from substrate
ECMB empty combs
EQUL equilibrium
FLTR filtration rate
FLYG flying behavior
FOOT foot retraction
FRZG freezing behavior
GBHV behavioral changes, general
HONY honey produced
INST sleeping time, induced
LOCO distance moved, change in direct movement
MIGR migration
MOTL motility
NMVM movements, number of
NVOC vocalizations, number of
PHTR phototactic response
PRVU predator vulnerability
RRSP righting response
RSPT response time to a stimulus
STRS observed stress
SWIM swimming
THML temperature tolerance
VACL valve closure
VCLF visual cliff

FDB Effect
Measurements

BGNG begging behavior
FCNS food consumption (amount or rate)
FDNG feeding behavior (activity)
FECL fecal production
FEFF feeding efficiency
FSTR food storage
FTIM feeding time
GFDB feeding behavior, general
LTBD litter breakdown
PRBE predatory behavior
STRK strikes (number of times food source was hit)
WCON water consumption

BCM BIOCHEMICAL

BCM Effect
Measurements

5HAA 5-hydroxyindole acetic acid
AABA alpha-aminobutyric acid
ACHL acetylcholine
ACID acid produced
ACRR acetylene reduction rate/plant roots nodulated
ACTN actin [a muscle protein]
ALAN alanine
ALBE albumen energy
AMAC amino acid(s), general term
AMMO ammonia
AMNH p-amino hippurate

ANTH	anthocyanins
ANTC	anthrocyanin
AOCN	arterial oxygen content
ARGI	arginine
ASCA	ascorbic acid
ASPA	aspartate
ATPT	adenosine triphosphate
BIOT	biotin content
C9BT	total 9B,19-cyclopropylsterols
CALC	calcium
CAMP	Adenosine 3',5'-cyclic monophosphate
CAPH	calcium/phosphorus ratio
CARB	carbohydrate
CARC	carotenoid content
CARO	carotene
CCON	carbon content
CDCO	cadmium content
CHLA	chlorophyll 'a' concentration
CHLB	chlorophyll 'b' concentration
CHLN	choline
CHLO	chlorophyll, general
CHLR	chloride
CHOL	cholesterol
CHYM	chymotrypsinogen
CNRA	carbon to nitrogen ratio
CO2C	carbon dioxide content
COCO	cobalt
CP1A	cytochrome P1A
CPRP	coproporphyrin
CREA	creatinine
CSTN	cysteine
CUCO	copper
CYB5	cytochrome
DGDG	digalactosyl diglyceride (glycolipid)
DISC	diethylsuccinate hydrolysis
DTBL	direct bilirubin (conjugated)
ESAA	amino acids, essential
ETHL	ethylene
FBNT	fibronectin [a large glycoprotein found on the surface of cells and mediates cellular adhesion, control of cell shape and cell migration]
FFTA	fatty acids, free or nonesterified
FLRS	fluorescence, used for algae or other organisms that naturally fluoresce, may be used to measure chlorophyll or population growth rate. For example, if it is specifically stated that fluorescence is used to measure chlorophyll A, code the measurement as CHLA.
GBCM	biochemical, general
GEMS	geosmin
GHEM	general hematology
GLCN	glycine
GLTH	glutathione
GLUC	glucose
GLYC	glycogen
GLYP	glycoprotein composition
GLYT	total glycolipid content
GMIN	glutamine
H2O2	hydrogen peroxide
HEME	heme content
HEMT	hematological parameters (Temporary AQUIRE code)
HIST	histidine
HMCT	hematocrit (anemia)
HMGL	hemoglobin
HNMS	N[3H-methyl]scopolamine
IBIL	indirect bilirubin (free)
ILEU	isoleucine
IRON	iron content
LACT	lactate
LCCT	leucocrit
LCTA	lactic acid
LEUC	leucine
LGHG	leghemoglobin
LIPD	lipid
LIPT	lipid content, total
LPSA	lipid soluble antioxidants
LYSI	lysine
MCHC	mean corpuscular hemoglobin concentration [the mean concentration of hemoglobin in the red blood cell (hemoglobin/hematocrit)]
MCHG	mean corpuscular hemeglobon [the mean mass of hemeglobin in the red blood cell (hemeglobin * 10/red blood cell count)]
MCPR	microsomal proteins
MCPV	mean corpuscular volume
MCYS	microcystin
ME4T	total 4a-methylsterols
METH	methionine
MGCO	magnesium
MGDG	monogalactosyl diglyceride (glycolipid) content
MGLB	methaemoglobin
MLDH	malondialdehyde
MNCO	manganese content
MTHL	menthol
MTLN	metallothionein
MUCR	muscarinic chlolinergic receptor
NCON	nitrogen
NEAA	amino acids, nonessential
NPSH	nonprotein sulfhydryl
NPSS	ninhydrid-positive substances
NRGC	energy compound
NUTR	nutrient status change
OHGL	O2 specific bond to haemoglobin
OLCO	oil content
OLYD	oil yield
ORNI	ornithine
P450	cytochrome P-450
PARG	phosphoarginine
PBHB	poly-B-hydroxybutyrate
PCLV	packed cell volume
PDST	phosphodiester
PEGE	Polyethylene glycol (PEG) efflux
PHEN	phenylalanine
PHOS	phosphorus
PHPH	pH
PHSC	phosphatidyl choline (phospholipid) content
PHSE	phosphatidyl ethanolamine (phospholipid) content
PHSG	phosphatidyl glycerol (phospholipid) content
PHSI	phosphatidyl inositol (phospholipid)
PHSP	phosphatide phosphorus
PHST	phospholipid content, total
PHYC	phycocyanin
PMST	phosphomonoester
PORP	porphyrin
POTA	potassium content
PPHT	phosphate
PRCO	protein content
PRLC	prolactin
PRSY	protein synthesis
PRTL	protein, total (check)
PRTO	protoporphyrin
PYRT	pyrethin
PYRV	pyruvate
RBVL	relative blood volume (volume/100g body weight)
RIBO	riboflavin content
RIDX	refractive index
SCON	sulfur content
SERI	serine
SODI	sodium content
SRTN	serotonin
SSUG	soluble sugars
ST5T	total (delta)5-sterols
ST8T	total (delta)8-sterols
STRH	starch content
SUGA	sugar content
TBAR	thiobarbituric acid reactive substances
TEAM	tetraethyl ammonium
TFAA	amino acids, total free
THBA	thiobarbituric acid
THRE	threonine
TLBL	bilirubin, total
TNSC	total non-structural carbohydrate
TRIB	tributyrin
TRIG	triglycerides
TRYP	tryptophan
TRYS	trypsinogen
TTAA	amino acids, total
TYMD	thymidine
TYRO	tyrosine
UREA	urea
URIC	uric acid
VALI	valine
VITE	vitellogenin
VTD3	vitamin D3
WTCO	water content
ZNCO	zinc content

ENZ Effect

Measurements

2OHB	2-OH biphenyl hydroxylase
450R	NADPH-cytochrome p-450 reductase
4OHB	4-OH biphenyl hydroxylase
AATT	alanine aminotransferase
ACHE	acetylcholinesterase
ACPH	acid phosphatase
AEPX	aldrin epoxidase
AHDX	aniline hydroxylase
ALAD	(delta) ? -aminolevulinic acid dehydrogenase
ALAS	(gamma) ?-ALA synthetase
ALDO	aldolase
ALPH	alkaline phosphatase
ANAE	a-naphthyl acetate esterase
APND	aminopyrine n-demethylase
ASAT	aspartate aminotransferase
ATPA	adenosine triphosphotase
ATRP	alanine transpeptidase
BAPH	benzo(a)pyrene hydroxylase
BCHE	buterylcholinesterase
BCOD	butoxycoumurin O-dealkylase
BGAL	(beta) ß-galactosidase
BPND	benzphetamine-n-demethylase
BROD	benzylresorufin O-deethylase
CAAH	carbonic anhydrase
CACA	choline acetyltransferase
CATP	calcium ATPase
CCOX	cytochrome C-oxidase
CEST	cholinesterase
CHIT	chitobiase
CRKI	creatine kinase
CYST	cysteine dioxygenase
DHYD	NADPH dehydrogenase
DSCA	diethylsuccinase
ECOD	ethoxycoumurin O-deethylase
EPHY	epoxide hydrase
EROD	7-ethoxyresorufin O-deethylase
ESTE	esterase
FDPA	fructose-diphosphate aldolase
G6PD	glucose-6-phosphate dehydrogenase
GENZ	enzyme, general
GGTR	(gamma)?-glutamyltransferase*
GLAD	glutamic acid dehydrogenase
GLPX	glutathione peroxidase
GLRE	gluthione reductase
GLTR	glucuronyl transferase
GLUR	(beta) ß-glucoronidase
GLYD	Glyceraldehyde dehydrogenase
GOTR	glutamic-oxaloacetic transaminase
GPTR	glutamic pyruvic transaminase
GSTR	glutathione S-transferase
HPSE	hydrogen peroxidase
HXBH	hexobarbital hydroxylase
LADH	lactate dehydrogenase
LDMD	lactate dehydrogenase/malic dehydrogenase ratio
MADH	malic dehydrogenase
MAOA	mono amino oxidase
MCOD	methoxycoumarin O-dealkylase
MG6P	microsomal glucose 6-phosphatase
MUDH	multiple dehydrogenases (measured total produced by soil microorganisms)
NCCR	NADPH cytochrome C reductase
NKAT	sodium potassium ATPase
ORCT	ornithine carbamoyl transferase
PBES	phenyl benzoate esterase
PBHD	pentobarbital hydroxylase
PCOD	propoxycoumarin O-dealkylase
PHLA	phosphorylase A
PNAD	p-nitroanisole demethylase
PODA	peroxidase (POD) enzyme activity
PROD	pentylresorufin O-deethylase
SBDH	sorbitol dehydrogenase
SCDH	succinate dehydrogenase
SGOT	serum glutamate oxalo acetate transaminase
SGPT	serum glutamic pyruvic transaminase
SODA	super oxide dismutase (SOD) enzyme activity
THTR	thiol transferase
TRBA	tributyrinase
TRIE	triacetin esterase
UDPT	uridine diphosphate (UDP) glucuronyl transferase
URSE	urease activity

* GGT is also used for gamma glutamyl transpeptadase, a liver enzyme; prior to using the GGTR code verify that indeed GGT is used as the transferase in the current publication. A new code will be needed for the transpeptadase.

HRM Effect
Measurements

ABSA	abscisic acid	EPIN	epinephirine	NORE	norepinephrine
ANDR	androgen	ESDL	17-beta estradiol	PRGS	progesterone
AUXN	auxin	ESTR	estrogen	THYR	thyroxine
CORT	corticosterone	GHRM	hormone, general changes in	TRII	triidothyronine
CRTS	cortisol	GIBB	gibberellin	TSTR	testosterone
CYTK	cytokinin	KTST	11-ketotestosterone		
DOPA	dopamine				

GRO GROWTH**

DVP Effect
Measurements

ABNM	abnormal	FLDG	fledged/female or /brood	PHRV	post harvest character influenced
CCLV	cell clevage	FORM	organ/tissue formation		
COLR	color	GDVP	development, general	PUPA	pupation
DFRM	deformation	GRRT	growth rate	RSPN	resorption (tail resorption in frogs)
DVLP	slowed, retarded, delayed or non-development	MALF	malformations		
		MATR	maturation	SXDP	sexual development
EMRG	emergence	MMPH	metamorphosis	TEMR	time to first emergence
ENDD	endoderm differentiation	MOLT	molting	TERA	teratogenesis
EVFO	envelope formation	NORM	normal	WEAN	weaned
FIRM	firmness	PHRN	post harvest character no effect		

GRO Effect
Measurements

ABNM	abnormal	HGHT	height	SPGR	specific growth rate [individual growth measurement calculated by using the net weight divided by time]
BMAS	biomass; includes harvest yield, fruit or seed yield, mass of organism, mass of population, standing crop, productivity.	LGTH	length		
		NNOD	dry mass/plant roots not nodulated		
		NODE	# nodules/nodulated plant roots		
				STNT	stunting
COND	condition index	PMTR	perimeter	WDTH	width
DWGT	dry weight (AQUIRE only)	RGNR	limb/ body part regeneration	WGHT	weight
GGRO	growth, general	SIZE	size	WWGT	wet weight (AQUIRE only)
GREI	growth efficiency index				

MPH Effect
Measurements

COSC	caudal ossification center
DEPO	shell deposition
GMPH	general morphological changes
LGTH	length
MOSC	metacarpal ossification center
SHPE	change in shape
SMIX	somatic index; organ weight in relationship to body weight
SOSC	sternal ossification center
SRIB	supernumerary ribs
STRC	structural changes
STTO	strength and tone
WGHT	weight

CEL Cellular Effects

CEL Effect
Measurements

AGGR	aggregation/adhesion	CTVR	cell turnover	DNSY	density
BASO	basophil	CYTO	cytotoxicity	EOSN	eosinophil
CCHG	cell changes	DEND	dendrite receptors	ERTH	erythoroblasts
CILR	ciliated type II receptors	DIVC	dividing cells	GBLT	goblet cells

** For generational effects, ie. F1 exposed, measurements from F2, F3, etc. add JV, EM, F1, F2, etc. to the sample units data field

GLCL	gland cells
GRAN	granulocyte
LEUK	leukocytes
LMPH	lymphocyte
MONO	monocyte
NCEL	number of cells
NEUT	neutrophil
OGNL	organelle
OSRS	osmotic resistance/RBC
PLAS	plasmolysis
RBCE	red blood cell
RETI	reticulocytes
SGDN	signal density
SPLO	splenocytes
STRC	structural changes
THRM	thrombocytes
TWBC	white blood l count, total
UBWB	white blood cell, undifferentiated blasts

GEN Effect

Measurements

CHLM	chlorophyll mutation/albino mutants
DAMG	damage
DNAC	DNA concentration
DNAS	DNA synthesis rate
GGEN	genetics, general
GTPF	genotype frequencies
ME1A	meiotic abnormalities, 1st anaphase
ME1M	meiotic abnormalities, 1st metaphase
ME2A	meiotic abnormalities, 2nd anaphase
ME2M	meiotic abnormalities, 2nd metaphase
MEDM	meiotic abnormalities, diakinesis and 1st metaphase
MEIA	meiotic abnormalities, general
MEIR	meiosis rate
MIAT	mitotic abnormalities, ana-telophase
MIBC	mitotic abnormalities, binucleate cell
MIBG	mitotic abnormalities, bridge
MICL	mitotic abnormalities, clumping
MICY	mitotic abnormalities, cytomixis
MIES	mitotic abnormalities, early separation
MIEX	mitotic abnormalities, exclusion
MIFR	mitotic abnormalities, fragment
MIIN	mitotic abnormalities, interphase cells
MILG	mitotic abnormalities, laggard
MIMN	mitotic abnormalities, micronuclei
MIMT	mitotic abnormalities, metaphase
MINB	mitotic abnormalities, nuclear budding
MINF	mitotic abnormalities, nuclear fusion
MIPO	mitotic abnormalities, disturbed polarity
MIPR	mitotic abnormalities, prophase
MISK	mitotic abnormalities, stickiness
MITA	mitotic abnormalities, general
MITI	mitotic index (#mitoses/total cells)
MITR	mitotic rate
MMRN	metallothionein mRNA
MNUC	micronuclei increase
MUTA	mutation
NABN	nuclear abnormalities
RNAC	RNA concentration
RNAS	RNA synthesis rate
RNDN	RNA to DNA ratio
SEXE	sex expression change
TSLE	translocation efficiency

HIS Effect

Measurements

ALYS	autolysis
ARTS	arteriosclerosis
ATPH	atrophy
CLPG	clumping pigment granules
CTYP	percent cell type
DEGN	degeneration
DISO	cellular disorganization
EDMA	edema
GHIS	histological changes, general
GLSN	gross lesions
HEMR	hemorrhag
HYCE	hypocellularity
HYDS	hydropic swelling
HYPL	hyperplasia
HYPT	hypertrophy
LESI	lesions
MELM	melanomacrophages
NCRL	necrotic lesions
NCRO	necrosis
NPHR	nephrosis
SWEL	swelling, swollen
TFLR	tissue damage measured by fluorescence under dyes or in UV light
USTR	ultrastructural changes

MOR MORTALITY OR SURVIVORSHIP***

MOR Effect

Measurements

GMOR	mortality/survival, general
HTCH	hatch
MDTH	mean time of death
MORT	mortality
SURV	survival
T100	time to 100% mortality
TDTH	time to death
TKNO	knockdown

PHY PHYSIOLOGICAL

IMM Effect

*** Ditto.

Measurements

ABDT	antibody titres
ASHG	anti-sheep red blood cell hemaglutinin
DHYP	delayed type hypersensitivity
GIMM	immunity, general
LYMP	lymphocyte activity
NKCA	natural killer cell activity
PARA	amount or percent animals infested with parasites
PHAG	phagocytosis
PRNF	parasitic infection
RSTT	rosette response, rosette forming cell concentration
THYM	thymocyte activity

INJ Effect

Measurements

CLRS	chlorosis
CURV	curvature
DAMG	damage
DESI	desiccation
GINJ	injury, general
SYMP	symptom severity index
TUMR	tumor induction
VASC	vascular disruption

ITX Effect

Measurements

ANOR	anorexia
ATAX	ataxia
CONV	convulsions
GITX	intoxication, general
IMBL	immobile
INCO	incoordination
MBLT	moblilty
PARL	paralysis
TINT	time to signs of intoxication

PHY Effect

Measurements

ABSC	abscission
ADPO	oxidative phosphorylation
ANBC	aniline binding capability
ASML	assimilation efficiency
BDVL	blood volume
BLUM	bioluminscence
BTMP	body temperature
CFIX	carbon fixation
CO2T	carbon dioxide tension, partial pressure of carbon dioxide, PCO2
COLD	cold hardiness
CTIM	clotting time
DORB	dormancy break
DORI	dormancy induction
EECG	electroencephalogram
EEUR	endogenous excreted urea
EXCR	excretion rate
FDCV	food conversion efficiency
FEUP	iron uptake
GFRT	glomerular filtration rate
GPHY	physiology, general
GRAU	granule/grain creation
GSTF	gas transfer
HTRT	heart rate
HYDR	hydration
IOUP	ion uptake
IRRI	irritation
MCCN	microorganism cenosis [a group of organisms in a self-sufficient community naturally occupying a small area with a uniform environment throughout]
MYCO	mycorrhizal colonization
NAST	nastic movements
NFIX	nitrogen fixation
NPRA	net photosynthetic rate
NRSP	neuroresponse
NUPT	nitrogen uptake
OPMO	opercular movements
OSMO	osmolality
OXYG	oxygen consumption
OXYT	oxygen tension, partial pressure of oxygen dioxide, PO2
PERA	protein efficiency ratio
PIGM	pigmentation
PRIN	PR intervals
PSII	photosystem II (PSII) electron transport activity
PSYN	photosynthesis
PTUC	protein utilization coefficient
PUPT	phosphorus uptake
RCRA	renal clearance ratio
RESP	respiration, O2 production, CO2 production
RESQ	respiration quotient
RPRT	respiratory rate
SCGR	scope for growth (SFG= (energy consumed * assimilation efficiency) - energy lost through respiration)
SENE	senescence
SENI	senescence induced/accelerated
SENR	senescence retarded
SRLO	spectral reflectance/shift to longer wavelengths
SRSH	spectral reflectance/shift to shorter wavelengths
STOM	stomatal aperture
SWEL	swelling
TEUR	total excreted urea
TEXT	texture change
THRG	thermoregulation
TRAN	transpiration
VENT	ventilation
WACN	water content
WILT	wilt
ZNUP	zinc uptake

POP POPULATION

POP Effect
Measurements

ABND	abundance (number of organisms/area; density)
BMAS	biomass; includes harvest yield, fruit or seed yield, mass of organism, mass of population.
CVER	cover, canopy
DRFT	drift
DVRS	diversity, evenness
GPOP	population changes, general
INDX	index to population size; count, number, abundance
IRIN	intrinsic rate of increase
NCHG	population change (change in n/change in time)
PBRA	biomass turnover ratio (population/biomass)
PCCP	population carrying capacity
PGRT	population growth rate
PRPE	predator/prey dynamics
RCLN	colonization rate
RCPR	recapture ratio
SEXR	sex ratio
SURF	surface area
TRAP	trappability

REP REPRODUCTION

REP Effect
Measurements

ABNM	abnormal
ABRT	abort
BMAS	biomass; includes harvest yield, fruit or seed yield, mass of organism, mass of population.
BNDG	pair bonding nesting behavior
COUR	courtship behavior
CYNG	care of young, nest attentiveness
EGPN	eggs per nest
FERT	fertile, fertility
FERZ	fertilization
FLOR	floral induction
FRMS	frames, bees
FRUH	percent fruit harvested
GERM	germination
GIDX	gestation index
GREP	reproduction, general
GSTT	gestation time
INFL	inflorescence
INFT	infertile
LACG	lactating
NANT	nests abandoned
NCLU	corpus lutea, number of
NDAY	number of days between eggs laid
NEGI	number of eggs incubated
NINC	number of nests incubated
NOPN	number of organisms per nest
NPOD	number of pods
NSNT	successful nests
NSPN	number spawning
NSTA	number of active nests
NSTI	nest initiation
NSTS	number of nests produced
NTSZ	nest size
NUNT	unsuccessful nests
OBRD	open brood
OEGP	onset of egg production
OOCY	fully developed oocytes
OVRT	ovulation rate
PIPD	pipped
PLBR	pairs with litter or brood
PRFM	pregnant females in a population
PROG	progeny; includes counts, numbers, clutch, litter or brood size, progeny produced within a specified time period, numbers of progeny per parent organism.
PRTH	parthenocarpy
RBEH	reproductive behavior changes
RPRD	reproductive capacity
RSEM	resorbed embryos
RSUC	reproductive success (general)
SBRD	sealed brood
SEED	seed number
SPCL	sperm cell counts
SSET	seed set (no. seeds/no. florets)
STRL	sterility
TSPN	time to spawn
VEGR	vegetative reproduction
VIAB	viable offspring/seed

AEG Effect
Measurements

CRAK	cracking
ESIN	eggshell index
FERT	fertile, fertility
LGTH	length
QUAL	quality
SHLL	shell, percent
SIZE	size
SOFT	softness
THIK	thickness
VIAB	viable
VOLU	volume
WDTH	width
WGHT	weight
YOLK	yolk, percent

SYS ECOSYSTEM

PRS Effect
Measurements

BGCM	biogeochemical
CMIN	carbon minerialization
CO2P	CO_2 evolution
DCMP	decomposition
GPPR	gross primary productivity/respiration
NITR	nitrification
NMIN	net mineralization
PPRO	primary productivity
SPRO	secondary productivity
SRES	system respiration
TROP	efficiency of trophic transfer between different levels in the food chain; assimilation efficiency

NOC NO GROUP CODE

NOC Effect
Measurements

MULT	multiple effects reported as one result
<NONE>	none
NRNR	endpoint reported without a specific effect
~XXX	delayed effect

Appendix T. Endpoint Codes and Definitions

ATCN	Asymptotic threshold concentration: The concentration of a chemical at which some percentage of a population of test organisms is in a state of approximate homeostasis for some prolonged period of time.
BAF	Bioaccumulation factor: A value that is the "ratio of the concentration of a chemical in the organism to that in the medium (usually water). Bioaccumulation refers to both uptake of dissovled chemicals from water (bioconcentration) and uptake from ingested food and sediment residues." (Casarett et.al. 1986) For TERRETOX, use BAF to reflect concentration/ accumulation in tissues regardless of whether the author addresses the ratio as BAF or BCF. The use of a BCF code in the TERRETOX database will require prior approval.
BCF	Bioconcentration factor: A term describing the degree to which a chemical can be concentrated in the tissues of an organism in the *aquatic environment* as a result of exposure to waterborne chemical at steady state during uptake phase. The BCF is a value which is equal to the concentration of a chemical in one or more tissues of the exposed aquatic organism divided by the average exposure water concentration of a chemical in the test. (Rand 1995) Use BCF only when reported by author for water exposures ie., AQUIRE; if BCF reported for terrestrial organisms/plants code as BAF.
ICxx	Inhibition concentration: concentration of the inhibitor required to give xx% inhibition of enzyme activity under specific conditions
LCxx	Lethal concentration to xx% of test animals
LDxx	Lethal dose to xx% of test animals
LETC	Lethal Threshold Concentration: Toxicity curve asymptotic concentration indicating an incipient LC50 value. Acute lethal action has essentially ceased.
LOEL	Lowest-observable-effect-level: lowest dose (concentration) producing effects that were significantly different (as reported by authors) from responses of controls (LOEAL/LOEC)
LTxx	Lethal time, median: time required for xx% of a population to die from a given dose; also reported as "STxx" - survival time for xx% of a population
MULT	Multiple statistical significance in ranged observation values
NOEL	No-observable-effect-level: highest dose (concentration) producing effects not significantly different from responses of controls according to author's reported statistical test (NOEAL/NOEC)

Appendix U. Response Site Codes

AB	Aboveground Portion, Plant
AD	Adipose Tissue
AF	Amniotic Fluid
AG	Accessory Gland
AL	Albumen (egg white)
AM	Adductor Muscle
AP	Appendages
AR	Adrenal Gland
AS	Air Sac
AT	Alimentary Tract
BB	Bulb
BC	Buccal mass
BD	Bud
BI	Bile
BIL	Bill
BL	Blood
BM	Bone Marrow
BO	Bone
BOD	Body, Whole
BR	Brain
BT	Breast
BU	Bursa
BV	Blood Vessel
BW	Bee's Wax
BY	Byssus
CA	Cartilage
CC	Cocoon
CE	Coelomic fluid
CEL	Cell
CG	Cloacal gland
CRG	Cerebral ganglion
CH	Chord, spinal
CL	Claw
CLM	Coelomocytes
CM	Crown to Rump
CN	Cotyledon
CO	Collagen
COL	Coleoptile
COR	Corm
CP	Capat
CR	Crop
CS	Chromosome
CU	Culture Cells
CUT	Cuticle
CX	Caudex
CY	Cytosol
DG	Digestive Gland
DT	Digestive Tract
EA	Ear (Corn)
EAL	Ear leaf (Corn)
EC	Excreta
EG	Egg
EL	Elytrom
EM	Embryo
EMS	Embryonic shoot cells
EN	Entrails
EP	Endoplasmic Reticulum
ER	Erythrocyte
ES	Esophagus
ET	Edible Tissue
EU	Egg Cuticle
EV	Exuviae
EX	Exoskeleton
EY	Eye
EZ	Enzyme
FC	Feces
FD	Frond
FE	Feathers
FI	Fin
FL	Fillet
FLB	Flower Bud
FLW	Flower/ Inflorescence
FM	Femur
FO	Foot
FOD	Fodder
FR	Fruit
GB	Gall Bladder
GG	Green Gland
GI	Gills
GO	Gonads
GOL	Golgi Apparatus
GP	Gills+Palps
GR	Grain
GS	Germinated seed
GT	Gastrointestinal Tract
GU	Gut
GZ	Gizzard
HA	Hair
HC	Hypocotyl callus cells
HD	Head
HE	Heart
HL	Hemolymph
HM	Humerus
HO	Honey
HP	Hepatopancreas
HY	Hypothalamus
HYP	Hypocotyl
IN	Intestinal Tract
IR	Interrenal gland
IT	Internode
KI	Kidney
KR	Kernal
LC	Leaf chloroplast
LD	Lipid, Fat
LE	Leaf
LEI	Leaf Index
LEO	Leaf, Old
LEY	Leaf, Young
LG	Leg
LI	Liver
LM	Limb
LP	Labial Palps
LU	Lungs
MA	Mantle
MB	Muscle+Bone
MC	Microsome
ME	Meristem (apical or axillary)
MI	Midgut and Midgut Gland
MIT	Mitochondria
MK	Milk, lactating females
MM	Mammary Tissue
MO	Mucous
MOM	Mother cells, pollen
MR	Membrane
MS	Mesenteric Lymph Node
MT	Multiple Tissue/ Organs
MU	Muscle
MUL	Multiple Sites
MV	Microvilli
ND	Nodule, root
NE	Nervous Tissue
NG	Nasal Gland
NK	Neck
NL	Needle
NR	Not Reported
NU	Nuclei
OD	Oviduct
OG	Organ
OL	Olfactory
OR	Organelle
OV	Ovaries
PA	Palps
PAN	Panicle
PC	Pyloric ceca
PD	Pod
PE	Penis
PG	Prostrate Gland
PI	Pituitary Gland
PL	Plasma
PLC	Placenta
PO	Pollen, pollen grain
PR	Proventriculus
PRG	Progeny
PS	Pancreas
POS	Pod + Seed
PT	Petioles
PTU	Plant, Unspecified
PU	Pollen tube
PX	Pharynx
RC	Rectum
RD	Radicle
RH	Rhizome
RL	Root, Lateral
RM	Retractor Muscle
RO	Root
ROC	Root Cortex
RP	Root, Primary
RR	Residual, Remnant, Carcass
RS	Root + Stem
RT	Reproductive Tissue
RTC	Root tip cells
RU	Radius-Ulna
RZ	Root + Rhizome
SA	Salt Gland
SB	Shell, Membrane
SB2	Stem/Stalk, Lower Half
SC	Scale
SD	Seed
SDL	Seedling
SE	Sensory Organs
SG	Shell Gland
SH	Stomach
SI	Siphon
SK	Skin, Epidermis
SL	Shell, Eggshell
SLV	Stem to Leaves
SM	Sperm
SN	Skeleton
SO	Shoot
SP	Spleen
SPK	Spikelet
SQ	Shell (Aquatic)
SR	Serum
SRB	Strobilus (mega-, micro-, etc.)
SS	Stem/Stalk
ST	Soft Tissue
STR	Straw
STV	Stover [mature cured stalks of grain with the ears removed that are used as feed for livestock (MW online)]
SU	Stalk/Stem, Upper Half
SV	Seminal Vesicle
SWB	Swim Bladder
SX	Submaxillary Gland
TA	Tail
TB	Tibia
TE	Testes
TF	Tuber Flesh
TG	Thigh muscle
TH	Thorax
TI	Tissue
TLI	Thalli
TM	Tarsus-Metatarsus
TN	Tentacles
TOP	Tops (Plant)
TP	Tuber Peeling
TR	Tarsus
TS	Thymus
TT	Tibiotarsus
TU	Tuber
TY	Thyroid
UB	Urinary Bladder
UG	Uropygial Gland
UR	Urine
UT	Uterus
VD	Vas Deferens
VE	Vertebra
VI	Viscera
VL	Villi
WI	Wings
WL	Wall, Body
WO	Whole Organism
YO	Yolk

1. Sample units correspond to the sample size number; ie. the units represent the entity observed. For example, for a sample size of 190 eggs, the sample unit is eggs; therefore, if the effect is HATch, the effect measurement HATCH, and the observation response value is 90%, then 90% of 190 eggs hatched (see Appendix _ for applicable codes). Code NR if not reported.